DOCUMENT RESUME

ED 143 933 CG 011 712

AUTHOR Merkel-Keller, Claudia
TITLE Sex Differences in Mathematics: An Investigation of Sex Differentiated Attitudes Toward Mathematics and Sex-Differentiated Achievement in Mathematics on the Ninth Grade Level in Eight Schools in New Jersey.
PUB DATE Apr 77
NOTE 130p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, N.Y., April 4-8, 1977); Best Copy Available; some tables may reproduce poorly

EDRS PRICE MF-$0.83 HC-$7.35 Plus Postage.
DESCRIPTORS *Academic Achievement; Developmental Psychology; Educational Research; Expectation; *Grade 9; *Mathematics; Research Projects; Secondary Education; Secondary School Students; *Sex Differences; Sex Role; *Student Attitudes

ABSTRACT

This study was undertaken: (1) to determine achievement in mathematics of ninth graders (general mathematics students and algebra students) in eight public schools in New Jersey as measured by an achievement test developed and tested by the author; (2) to determine attitudes toward mathematics of the students as measured by an attitude scale developed and tested by the author; (3) to provide data regarding sex-differentiated attitudes toward mathematics that could be used to isolate factors influencing attitudes toward mathematics; and (4) to correlate attitude and achievement data for the sample of students studied. Findings reveal three key components in attitudinal orientation toward mathematics: (1) attitudes toward mathematics as a subject; (2) learner's self-concept and the sex-role stereotyping dimension; and (3) parental expectations. Parental expectations emerged as factor two for females, and as factor three for males. Both sexes evidenced the same primary factor, i.e., attitudes toward mathematics as a subject. Weak statistical trends related to differences in mathematical achievement may attest to changing teaching styles in the mathematics classroom and recognition of sex-role stereotyping. Also, ninth grade may not be the critical level to determine strong statistical sex differences in mathematics ability and attitude. (Author)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED143933

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

NCME - 15 B

9.12

Sex differences in mathematics: An investigation of sex-differentiated attitudes toward mathematics and sex-differentiated achievement in mathematics on the ninth grade level in eight schools in New Jersey.

SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: CG SE

In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

Claudia Merkel-Keller
Educational Improvement Center-NW
Halko Drive
Cedar Knolls, New Jersey 07927

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Claudia Merkel-Keller
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

BEST COPY AVAILABLE

A paper presented at the American Educational Research Association Conference, New York City, New York, April 5-7, 1977.

CG011712

Background of the Study:

In mathematics, throughout history, creative thinkers stand out, -- Niels Henrik Abel, Johann Bolyai, Georg Cantor, René DesCartes, Euclid, Leohnard Euler and Pierre Fermat to name a few.

Might one not logically ask, "Where are the Niela Henrika Abels, Johanna Bolyais, Georgia Cantors, Renée DesCartes, Apollonia Euclids, Leona Eulers and the Petra Fermats?"

Did God indeed bestow certain intellectual capabilities on men that were not granted to women? If one answers yes, the dialogue has ended. If one answers no, then one must question the obvious void of women's activity and contribution in the field of mathematics.

Some researchers notably Richard Stafford (1972), believe that mathematics ability is determined by genetic make-up, the over-all inherent parameters being linked to the sex-recessive gene. Other researchers contend that sex-role stereotyping and role expectations put certain constraints on individual intellectual development and self-fulfillment. Society has set confining parameters within which men and women have traditionally operated. Kagar (1972) and others found that sex differences are socially rather than physiologically defined. Hence, stringent role definitions might account for the significant lack of women in such areas as mathematics, physics, chemistry and the other sciences. Additionally, it is important to point out that societal influences have char-

acterized mathematics as a traditionally male undertaking and language arts as a typically female orientation.

Bobbe (1971) conducted an investigation with 206 boys and 197 girls in grades four through six. The results of the study showed that boys and girls tended to sex-type all school subjects.

In a study of four schools, Minuchin (1966) concluded that schools did affect the developing sexual identity of the learners by directly or indirectly influencing sex-role standards.

Examining behavior conforming to parental expectations between parents and sons in attitudes toward mathematics, Hill (1967) found that mathematics was part of the male sex role for the father but not for the mother. Lynn (1969) also pointed out that attitudes toward mathematics were clearly "sex-typed" in our culture, the males having the more positive attitude toward mathematics since the males tended to identify with a cultural stereotype of the masculine role.

Educational research substantiated the fact that attitude toward an academic subject may influence the learners performance in that cognitive area. The formation of student attitudes toward mathematics is partially dependent upon and is partially shaped by parental, teacher and peer expectations and pressures, by the general school experience and by socio-cultural experiences and interactions.

Voluminous research has been conducted in the area of the learner's attitude toward mathematics without regarding sex as a variable. Aiken (March, 1970 and October, 1970) concluded that there was little empirical data on the

role of attitudes of the two sexes toward mathematics, but that sex role was related to attitude and achievement in mathematics.

Generally, the research that has been done in the area of sex-differentiated attitude toward mathematics shows no stable pattern across sex. Many contradictory results have been reported for specific grade levels.

Examining mathematics achievement, Carlsmith (1964) studied factors influencing mathematics scores and found that "the masculine conceptual approach" was acquired through close and affable contact with the father.

In contrast, Hilton and Berglund (1973) investigated sex-typed interests as a possible cause of differences in mathematical achievement between the sexes. They investigated mathematics achievement and compared it with biographical questionnaire responses. In grade five, no differences in achievement were noted but later the boys surpassed the girls.

Summarizing the research that has been done in the mathematics area relating to differences in performances between males and females, general trends indicated that there are no significant differences between males and females with respect to academic achievement in mathematics during the early elementary and upper elementary school years. Overall male superiority in performance on the whole is noted. It should also be pointed out that much research has been conducted without an eye toward examining sex-differentiated performance in mathematics achievement. When sex was considered, the research findings were mutually contradictory and inconsistent.

Objectives of the Study:

Recognizing the contradictory and inconsistent research base relating to differences in mathematics achievement and attitudes toward mathematics by sex, this study was undertaken:

1. to determine student achievement in mathematics of ninth graders (general mathematics students and algebra students) in eight selected public schools in New Jersey as measured by an achievement test that was developed and field tested by the author prior to use.

2. to determine attitudes toward mathematics of ninth grade students (general mathematics students and algebra students) in eight selected public schools in New Jersey as measured by an attitude scale that was developed and field tested by the author prior to use.

3. to provide data regarding sex-differentiated attitudes toward mathematics that could be used to isolate factors influencing attitudes toward mathematics.

4. to correlate attitude and achievement data for the sample of students studied.

Ninth grade was chosen as a target area in view of the fact that student performance was relatively consistent over sex during the early elementary and upper elementary school experience. Predicated on the research, it was felt that ninth grade might provide the threshold data for striking trends relating to sex-differentiated achievement in mathematics and sex-differentiated attitudes toward mathematics due to the societal influences and pressures at this particular time phase in a student's home and school experience.

Methodology of the Study:

Development of Instruments: Attitude Scale

Based on a comprehensive review of the literature, it was evident that many factors influence attitude toward mathematics -- including parents, peers and teachers. An attitude scale was designed to incorporate attitude statements relating to parental expectations, peer inter-relationships and teacher appraisals by the students. Attitude statements relating to the student's degree of self-concept and self-esteem were also included to determine if there was any polarization on what is termed the "sex factor". Attitude statements dealing with like or dislike of mathematics as a subject were also included, since it was felt that the student's like or dislike of mathematics will be directly reflected by his or her achievement in mathematics. The resulting attitude scale consisted of a five-point Likert scale containing 37 items.

The items were designed to measure the respondent's attitude toward mathematics as a subject, his or her self-concept and self-esteem, parental expectations, peer pressures, and teacher appraisals by the learner.

Items were positively and negatively weighed with the student's attitude score being the summation of the individual item scores.

The attitude scale was field tested. Based on factor analytic data as well as cluster analysis (correlation and distance) of the field test data the original instrument was modified from 37 items to 25 items.

Items from the revised attitude scale:

Strongly agree
Agree
Undecided
Disagree
Strongly disagree

1. Mathematics and arithmetic are my favorite subjects.

Strongly agree
Agree
Undecided
Disagree
Strongly disagree

2. Girls do not enjoy scientific interests.

Strongly agree
Agree
Undecided
Disagree
Strongly disagree

3. Albert Einstein, the great researcher and mathematician, could just as well have been a woman.

Development of Instruments: Achievement test

Since it was the design of the study to assess mathematics achievement for both general mathematics students and algebra students on the ninth grade level, an appropriate achievement test was constructed which would be suitable for both groups of students. The 35-item achievement test covered the following dimensions: basic manipulations (addition, subtraction, multiplication, and division) with whole numbers, decimals, fractions, and percents; conversions and word problems; simple algebra problems; and, basic geometry and

measurement problems. The test was designed to be multiple-choice in format with an answer sheet provided for the student. The student's score was based on the number of items correct out of 35. The test was developed to be administered in thirty minutes. A field test of the instrument was conducted. The achievement test was left unaltered based on the item analysis, item discrimination and item difficulty data generated by the field test study.

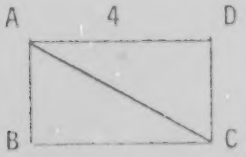
Items from the achievement test:

1) 40% of what number is 96?

   a. 240
   b. 960
   c. 2400
   d. 9600

2) A salesman/woman charges 7 1/2% commission on the sale of a boat. How much was his/her commission for selling an $8,500 houseboat?

   a. $637.50
   b. $740.00
   c. $810.25
   d. $900.75



3) If the figure ABCD above is a square with side 4, what is the area of ABC?

   a. 4 b. 8 c. 16 d. 32

Collection of Data :

This study was limited to eight public schools in New Jersey. The schools were not sampled using a random sampling strategy due to administrator constraints. The schools however do reflect different community types and ethnic as well as socio-economic differences. For this reason particular care was taken to avoid extrapolations of the results beyond the data base.

Four ninth grade classes (2 general mathematics classes and 2 algebra classes) were identified in each of the schools with the following hoped-for breakdowns:

1. Algebra Class A - female teacher
2. Algebra Class B - male teacher
3. General Mathematics - Class A - female teacher
4. General Mathematics-Class B - male teacher

It was not, however, possible to achieve the sex-teacher balance; therefore, sex of teacher was not a factor in this study.

After the field test had been conducted and revisions had been make in the instrumentation, data collection was initiated in late May and early June of 1973 in the eight pre-selected test sites. The classroom teachers in each of the settings administered the revised 25-item attitude scale and the 35-item achievement test. The attitude inventory required six-ten minutes to complete with the instrument being administered prior to the achievement test. The achievement test required thirty minutes administration time. The students were asked to indicate only their name, sex, school and the date on the attitude survey and also on the answer sheet of the achievement test. Students were also told that they were participating in a research study and that their performance on the test would not be related to their class grade. A total of 584 students participated in the study.

Results:

Attitudes toward Mathematics

Factor analysis and cluster analysis based on correlation coefficients and on distance were performed on the data for the entire group intact (n=570 students). The rotated factor matrix and factor loadings are presented in Table 1. Three factors were rotated in the factor matrix with 31.17% of the variance of the system explained by the first three factors.

Presented below are the attitude statements associated with each factor:

Factor I	statement 1, 5, 6, 11, 16, 19, 21, 23, 25
Factor II	statement 2, 12, 17, 22, 24
Factor III	statement 3, 8, 13, 18

Factor I identified statements that deal with attitudes toward mathematics as a subject. Factor II clearly isolated attitude statements dealing with the learner's self-concept and self-esteem and dealing with various aspects of sex role stereotyping. Factor III pulled together statements dealing with parental expectations. These same patterns of factor structure emerged from the cluster analysis based on distance. See Table 2 and Table 3 respectively. It is clear from the factor structure that attitudes toward mathematics as a subject emerged as a stronger factor than self-concept/self-esteem and likewise that self-concept/self-esteem emerged as stronger than parental expectations.

The attitudinal data were then analyzed separately for each of the subgroups by sex to determine if the same factor structure emerged.

For females, the varimax rotated factor matrix and factor loadings are presented in Table 4. Three factors were rotated. Factor I explained 54.3% of the variance; Factor II 25.6% of the variance; and, Factor III 20.2% of the variance. Presented below are the attitude statements associated with each factor:

Factor I	statement 1, 5, 6, 11, 16, 19, 21, 23, 25
Factor II	statement 3, 8, 13, 18
Factor III	statement 12, 17, 22, 24

Again, Factor I identified statements that deal with attitudes toward mathematics as a subject. Factor II isolated statements dealing with parental expectations. Surprisingly, Factor III for the girls pulled together statements dealing with self-concept and self-esteem and with sex role stereotyping.

For males, the varimax rotated factor matrix and factor loadings are presented in Table 5. Three factors were rotated. Factor I explained 47.3% of the variance; Factor II 28.2% of the variance; and, Factor III 24.4% of the variance. Presented below are the attitude statements associated with each factor:

Factor I	statement 1, 6, 11, 16, 19, 21, 25
Factor II	statement 3, 8, 9, 13, 18
Factor III	statement 2, 12, 17, 24

Likewise for the males, Factor I explained the major portion of the variance. The statements pulled together for Factor I for both sexes are almost identical with only statements 5 and 23 not being identified with Factor I for the boys. Factor II for the males isolated questions

dealing with parental expectations which concurred with the results that were found for the girls for Factor II. For Factor II for the males, questions 9 dealing with the father's expectations also was isolated in Factor II which was not the case for the girls. Likewise, Factor III dealt with the learner's self-concept and self-esteem. Factor III differed across sex only in one question. For the girls question 22 was identified, whereas for the boys question 2 was identified as being isolated under Factor III. Interestingly enough, statement 22 deals with the fact that Albert Einstein could just as well have been a woman.

The data were then partitioned into two groups -- those students enrolled in general mathematics class (n=225) and to those students enrolled in albegra class (n=345) to deal with the analysis of variance and covariance.

The ANOVA was carried out separately for all the algebra students in the eight schools. The ANOVA procedure was also carried out separately for all of the general mathematics students in the seven schools. One of the junior high schools was eliminated from the analyses since there were no females in either of the two general mathematics classes. The lack of females formed a so-called emply cell in the analysis which could not be treated computationally by existing programs.

See page 35 for guidelines as to the coding of the tables and for definitions of the respective variables.

The summation of the attitude scores for the general mathematics students was subjected to the ANOVA (see Table 6). Statistically significant differences were found due to school ($p < .01$). At lower

levels of significance, differences may be indicated due to classes within school ($p < .25$), due to sex ($p < .10$), and due to the students within school x sex interaction ($p < .10$).

Supporting data and tables of marginal means are presented in Appendix C (see Tables 7, 8, 9, 10, 11, 12, 13, and 14).

Examining Table 8 it is evident that students in schools 1 (Junior H.S. #2, Trenton) and 4 (East Orange H.S., East Orange), had higher attitude scores on the average than did students in the remaining five shcools.

The data trend indicates that girls had higher attitude scores than boys on the average, as evidenced by Table 10.

The summation of the attitude scores for the algebra students was subjected to the ANOVA (see Table 15). At lower levels of significance, differences may be indicated due to school ($p < .25$), due to classes within school ($p < .10$), and due to sex ($p < .25$).

Supporting data and table of marginal means are presented in Tables 16, 17, 18, 19, 20, 21, 22, and 23).

A trend may be noted, by examining Table 17, that students in schools 5 (North Plainfield H.S., North Plainfield) and 6 (Grover Cleveland H.S., Caldwell) had lower attitude scores, on the average than did students from the remaining six schools.

The trend suggests that girls had higher attitude scores than boys on the average as evidenced by Table 19.

Results:

Achievement in Mathematics

As was previously stated, the total achievement data (n=570) were partitioned into two groups, algebra students and general mathematics students, and analyzed separately utilizing ANOVA and ANCOVA.

The sum of the achievement scores for the general mathematics students was subjected to the ANOVA (see Table 24). Statistically significant differences were noted due to schools ($p < .005$) and due to classes within school ($p < .005$).

Supporting data and tables of marginal means are presented in Tables 25, 26, 27, 28, 29, 30, 31, and 32). Examining Table 26, it is evident that the achievement of students in school 4 (East Orange H.S., East Orange) was much lower on the average than that of the students in the remaining six schools.

Likewise, the sum of the achievement scores for the algebra students was subjected to the ANOVA (see Table 33). Statistically significant differences were noted due to schools ($p < .005$), due to classes within schools ($p < .005$). At lower levels of significance, differences may be indicated due to sex ($p < .25$), and also due to the school x sex interaction ($p < .10$). Supporting data and tables of marginal means are presented in Tables 34, 35, 36, 37, 38, 39, 40 and 41).

Examining Table 35, it is evident that the achievement of students in school 4 (East Orange H.S., East Orange) was much lower in average than that of the students in the remaining seven schools.

For the algebra students on the whole, the trend suggests that the achievement of boys (see Table 37) was slightly higher on the average than

the achievement of girls.

The sum of the achievement scores and attitude scores for the general mathematics students was subjected to the ANCOVA (see Table 42). Statistically significant differences were noted due to schools ($p < .005$), due to classes within school ($p < .005$) and also due to the covariate ($p < .005$); however, there were no significant differences due to sex, the school by sex interaction, or the subjects within the school by sex interaction. Supporting data and tables of marginal means are presented in Tables 43, 44, 45, 46, 47, 48, 49, and 50). Examining Table 44, it is evident that the students in school 4 (East Orange H.S., East Orange) had lower predicted achievement on the average than the students in the remaining six schools.

The sum of the achievement scores (dependent variable) and the sum of the attitude scores (independent variable) for the algebra students were subjected to the ANCOVA (see Table 51). Statistically significant differences were noted due to schools)$p < .005$), due to classes within school ($p < .005$), due to sex ($p < .05$), and due to the covariate ($p < .005$). At a lower level of significance ($p < .10$), a difference may be noted due to the school x sex interaction.

Supporting data and tables of marginal means are presented in Tables 52, 53, 54, 55, 56, 57, 58, and 59).

Again, examining Table 53, it is evident that the students in school 4 (East Orange H.S., East Orange) had lower predicted achievement on the average than the students in the remaining seven schools.

Table 53 indicates that boys had a higher predicted mean achievement than did girls.

The ANCOVA also indicates that one can indeed predict a student's mathematics achievement on this test based on his or her attitude as determined by the results of the attitude scale.

Summary of Results

Attitude Scale

Factor analysis and cluster analysis based on correlation coefficients and on distance were performed on the data for the entire group intact (n=570 students). Fourteen students were eliminated from the study since they omitted five or more responses on the attitude survey. Three factors were rotated in the factor matrix with 31.17% of the variance of the system explained by the first three factors.

Factor I identified statements that deal with attitudes toward mathematics as a subject. Factor II clearly isolated attitude statements relating to the learners self-concept, self-esteem and a sex-role stereotyping dimension. Factor III pulled together statements dealing with parental expectations. These same patterns of factor structure emerged from the cluster analysis based on distance.

The attitudinal data were then factor analyzed separately for each of the subgroups by sex to determine if the same factor structure emerged. Different factor structures were evident for the females and for the males.

A similar pattern of attitudes was noted for both sexes. Statistically significant differences due to sex were not found at $p < .05$; however, trends toward sex-differentiated attitudes may be noted at low levels of statistical significance with the girls having the more positive attitude on the average toward mathematics.

Achievement Test

As was previously stated, the total achievement data (n-570) were partitioned into two groups, algebra students and general mathematics students. The data was analyzed separately for each group utilizing ANOVA and ANCOVA.

No statistically significant differences due to sex were found on the achievement test for the general mathematics students. Statistically significant differences were also not found at $p < .01$ or $p < .05$ on the achievement test for the algebra students. It may be noted that at lower levels of statistical significance a differentiated trend was observed for the algebra students. This difference favored boys since they evidenced slightly higher achievement scores on the average than did girls.

Attitude and achievement in mathematics were significantly related for both groups as evidenced by the analysis of covariance (ANCOVA). Sex emerged as significant only for the algebra students with boys achieving a higher predicted mean score.

A summary table of means for all of the findings related to sex is presented below:

TABLE OF MEANS

	GENERAL MATHEMATICS STUDENTS		ALGEBRA STUDENTS	
	Males	Females	Males	Females
$\bar{x}$ attitude	83.02	85.27	86.08	88.21
$\bar{x}$ achievement	13.68	13.45	21.61	21.32
$\bar{x}$ predicted achievement	13.86	13.27	21.77	21.66

Educational Importance of the Study:

This research adds to the empirical data base on the role of attitudes of the two sexes toward mathematics related to achievement in mathematics. Since a focal point of the study was the development and field testing of an attitude measure toward mathematics, an instrument now exists with supporting research data which will allow for the identification of various components of attitudes toward mathematics related to sex of the student. Based on the research data generated by the attitude instrument (n=570), three factors emerged as key components in attitudinal orientation toward mathematics, i.e., attitudes toward mathematics as a subject (Factor I), learner's self-concept and the sex-role stereotyping dimension (Factor II), and parental expectations (Factor III). The research also provides data on the different factor structures related to mathematics attitude that emerged for males and females. For

females, parental expectations emerged as Factor II, whereas this dimension was Factor III for males. Both males and females evidenced the same primary factor, i.e., attitudes toward mathematics as a subject. This factor explained a major portion of the variance for both males and females. Below is a table summarizing the factor structure which emerged after the data was analyzed:

VARIMAX FACTOR ROTATION

	Entire Group Intact (n=570)	Males (n=295)	Females (n=275)
Factor I	Attitude toward mathematics	Attitude toward mathematics	Attitude toward mathematics
Factor II	Self-concept & sex role stereotyping	Self-concept & sex role stereotyping	Parental expectations
Factor III	Parental expectations	Parental expectations	Self-concept and sex-role stereotyping

The weak statistical trends related to differences in mathematical achievement documented in this study may attest to the already changing teaching styles implemented in the mathematics classroom and current recognition of sex-role stereotyping in mathematics. The impact of heightened awareness in terms of remediating sex-role stereotyping and sex bias may have already found its way into the mathematics classrooms. One might also conclude that ninth grade was not the critical grade level to determine strong statistical sex differences in mathematics ability and mathematics attitude.

The critical dimension, however, of this study was the development, field testing and refinement of an attitude measure toward mathematics which would isolate key structural components of a student's attitudinal spectrum related to mathematics.

REFERENCES

Aiken, L.R., Jr. Attitudes Toward Mathematics. Review of Educational Research, 1970, 40, 551-596.

Aiken, L.R., Jr. Nonintellective variables and mathematics achievement: Directions for research. Journal of School Psychology, 1970, 8, 28-36.

Bobbe, C.N. Sex-role preference and academic achievement. (Doctoral dissertation, Yeshiva University) Dissertation Abstracts, 1971, 32-03B-1818. No. 71-23, 923.

Carlsmith, L. Effect of early father absence on scholastic aptitude. Harvard Educational Review, 1964, 34, 3-21.

Hill, J.P. Similarity and accordance between parents and sons in attitudes toward mathematics. Child Development, 1967, 38, 777-791.

Hilton, T.L. & Berglund, G.W. Sex differences in mathematics achievement -- A longitudinal study. 1973, 20 p. (ED 069 789; MF and HC available from ERIC Document Reproduction Service.)

Kagan, J. The emergence of sex differences. School Review, 1972, 80, 217-227.

Lynn, D.B. Parental and sex role identification. Berkeley, Calif.: McCutchan Publishing Corp., 1969.

Minuchin, P.O. Sex differences in children: Research findings in an educational context. National Elementary Principal, 1966, 46, 45-48.

Stafford, R.E. Hereditary and environmental components of quantitative reasoning. Review of Educational Research, 1972, 42, 183-201.

INSTRUMENTS

Name: _____
Sex: _____
School: _____
Date: _____

GENERAL ATTITUDES TOWARD MATHEMATICS

This has been prepared so that you can tell how you feel about mathematics/arithmetic. Please circle the letter on the left to show how you feel about each statement.

SA--strongly agree
A--agree
U--undecided
D--disagree
SD--strongly disagree

Make certain to respond to each item. Remember: there is no right answer to any of the questions.

SA A U D SD 1. Mathematics and arithmetic are my favorite subjects.

SA A U D SD 2. Girls do not enjoy scientific interests.

SA A U D SD 3. My mother is disappointed when I get a poor grade on a math test.

SA A U D SD 4. My elementary school teachers liked math.

SA A U D SD 5. Math is not fun because I am not allowed to think for myself.

SA A U D SD 6. If I did not have to take mathematics I would not do so.

SA A U D SD 7. My elementary school teachers really knew their mathematics.

SA A U D SD 8. My mother thinks mathematics is important.

SA A U D SD 9. My father feels mathematics is unimportant.

SA A U D SD 10. I think I could do math better if I was better at reading the problems.

SA A U D SD 11. Math is not fun because there are too many rules to learn.

SA A U D SD 12. Women reason as clearly as men.

SA A U D SD 13. My parents continually encourage me to do well in mathematics.

SA A U D SD 14. My mother helps me with my math homework most of the time.

SA A U D SD 15. Reading in mathematics is harder than in other subjects.

SA A U D SD 16. I receive good grades in my math classes.

SA A U D SD 17. Boys are more logical than girls.

SA A U D SD 18. My parents expect me to do well in mathematics.

SA A U D SD 19. I would like to continue taking mathematics every year in high school.

SA A U D SD 20. Girls do better in English and reading skills than boys.

SA A U D SD 21. Mathematics is a boring and hard subject.

SA A U D SD 22. Albert Einstein, the great researcher and mathematician, could just as well have been a woman.

SA A U D SD 23. I was never as good in math as in other subjects.

SA A U D SD 24. Boys generally do better in mathematics than girls.

SA A U D SD 25. I don't like arithmetic because I often do most of the steps correctly and then make one mistake and get the whole thing wrong.

Mathematics--grade 9

You will be given 30 minutes to answer the 35 questions on this test. You may use any of the blank space provided on the test paper for scratchwork, but your answer must be marked on the answer sheet provided. No credit will be given for anything that you write on the test paper.

Your score on this test will be based on the number of questions which you answer correctly on the test. You will not loose any credit for wrong answers. Answer as many questions as you can in the indicated time. Do not spend too much time on any one of the questions.

Each of the questions on the test is followed by four suggested answers. Select the answer that best answers the question and fill in the appropriate space on your answer sheet which is provided.

Mark only one answer for each question.

MATHEMATICS--grade 9
Time 30 Minutes

1. $\begin{array}{r} 1300 \\ -\ 499 \\ \hline \end{array}$

(A) 801 (B) 811

(C) 1799 (D) 901

2. 1.5 + 19.99 + 22 =

(A) 19.136 (B) 30.360

(C) 42.149 (D) 43.49

3. Which is the largest?

(A) $\frac{18}{5}$ (B) $1\ \frac{3}{10}$

(C) $\frac{9}{2}$ (D) $\frac{35}{30}$

4. $4\ [3\ (7 + 6)] =$

(A) 64 (B) 156

(C) 176 (D) 20

5. 3.50 =

(A) 35% (B) 3.5%

(C) 350% (D) .35%

6. $\begin{array}{r} 437 \\ 73 \\ +241 \\ \hline \end{array}$

(A) 741 (B) 851

(C) 841 (D) 751

7. (809) x (600) x (10) =

(A) 4,854,000
(B) 485,400
(C) 4,804,000
(D) 4,854

8. Which has a remainder greater than 5?

(A) $3\overline{)21,735}$

(B) $5\overline{)795}$

(C) $9\overline{)278}$

(D) $7\overline{)323}$

9. Which per cent of 300 is 15?

(A) 12.5% (B) .05%

(C) 20% (D) 5%

10. To the nearest thousandth, 760.07631 is

(A) 76,000
(B) 760.076
(C) 760.080
(D) 80,000

11. 40% of what number is 96?

(A) 240 (B) 960

(C) 2400 (D) 9600

12. $\frac{10.009}{100}$ =

(A) .10009
(B) 1.0009
(C) 10.009
(D) 100.09

13. 62% of 55 =

(A) 3410 (B) 341

(C) 34.10 (D) 3.41

14. 42.7 - .007 =

(A) 42.693
(B) 42.000
(C) 42.703
(D) 42.603

15. $\frac{4}{12} \times \frac{9}{72}$ =

(A) $\frac{1}{12}$ (B) $\frac{1}{24}$

(C) $\frac{13}{84}$ (D) $\frac{36}{72}$

16. $\frac{\frac{21}{7}}{\frac{49}{3}}$ =

(A) 49 (B) $\frac{9}{49}$

(C) $\frac{49}{9}$ (D) $\frac{1}{49}$

17. $12\frac{1}{2}\%$ =

(A) $12\frac{1}{2}$ (B) .125

(C) .0125 (D) 1.25

18. $1\frac{7}{8} + 2\frac{1}{4}$ =

(A) $3\frac{7}{32}$ (B) $3\frac{8}{12}$

(C) $3\frac{1}{8}$ (D) $4\frac{1}{8}$

19. $1\frac{5}{6} - \frac{2}{3}$ =

(A) $\frac{7}{6}$ (B) $\frac{5}{6}$

(C) $1\frac{3}{6}$ (D) $\frac{4}{3}$

20. $\begin{array}{r} .413 \\ \times .071 \\ \hline \end{array}$

(A) .003304
(B) .293230
(C) .029323
(D) .330400

21. A salesman/woman charges $7\frac{1}{2}$ per cent commission on the sale of a boat. How much was his/her commission for selling an $8,500 houseboat?

(A) $637.50 (B) $740.00
(C) $810.25 (D) $900.75

22. -7 is between which of the following pairs of numbers?

(A) -10 and -8
(B) -6 and 0
(C) -8 and -3
(D) -6 and +8

23. If 1 and 1/2 baskets of apples weigh 18 lbs., what is the weight in lbs. of 6 baskets of apples?

(A) 62 (B) $68\frac{1}{2}$

(C) $70\frac{1}{2}$ (D) 72

24. An employee at a factory worked from 11:45 a.m. till 6:00 p.m. for $2.00 per hour. How much did he/she earn?

(A) $11.25 (B) $12.50
(C) $12.75 (D) $13.00

25.

The circle above is divided into 8 equal parts. What per cent of the total area is unshaded?

(A) 62.5% (B) 12.5%
(C) 37.5% (D) 75%

26. $[(-4)\ (-8)] + (-1) =$

(A) 31 (B) -31
(C) 32 (D) -33

27. If a/b = c/d given that a=4, b=3, c=8. What is the value of d?

(A) 6 (B) 4
(C) 3 (D) 2

28. There are 30 mathematics books and 18 English books. The ratio of English books to math books is

(A) 8 to 3
(B) 3 to 8
(C) 5 to 3
(D) 3 to 5

29. If $y = 3x + 2$, then when $x = 2$, $y =$

(A) 7 (B) 8
(C) 5 (D) 12

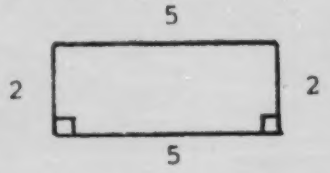
30. $2^3 \times 4^2 =$

(A) 8^6 (B) 8^5

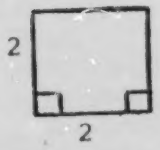
(C) 48 (D) 128

31. Which figure is not a parallelogram?

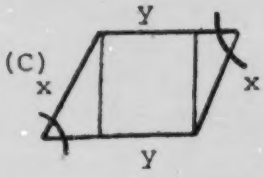
(A)



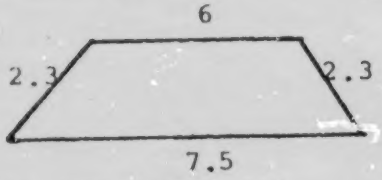
(B)



(C)



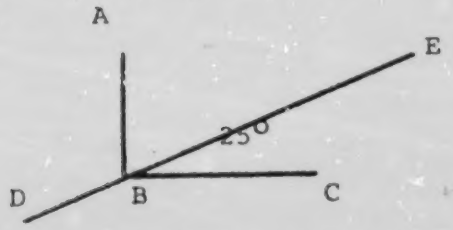
(D)



32. How many yards of fencing are needed to enclose 2 plots of farm land each 15 yards by 17 yards?

(A) 30 (B) 64
(C) 128 (D) 255

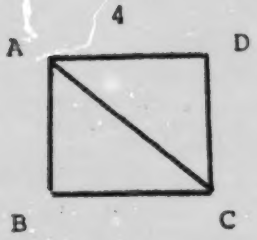
33.



If the figure above, if AB is perpendicular to BC, then the measure of angle ABE is

(A) 65 degrees
(B) 75 degrees
(C) 85 degrees
(D) 105 degrees

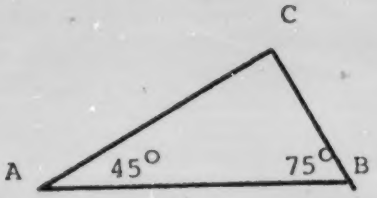
34.



If the figure ABCD above is a square with side 4, what is the area of ABC?

(A) 4 (B) 8
(C) 16 (D) 32

35.



In the figure above, the degree measure of angle ACB is

(A) 90 degrees
(B) 85 degrees
(C) 75 degrees
(D) 60 degrees

TABLE 1

ROTATED FACTOR MATRIX AND FACTOR LOADINGS
FOR ENTIRE GROUP (n=570)

Variable	Factor I	Factor II	Factor III
1	0.68583	-0.12282	0.18868
2	0.00947	0.44818	-0.06549
3	-0.02864	-0.06092	0.52780
4	-0.03157	-0.10124	0.21258
5	0.40266	0.19405	0.01886
6	0.69370	-0.05467	0.17284
7	0.00034	-0.02145	0.30277
8	0.15821	-0.12686	0.58728
9	0.07906	0.07223	0.39936
10	-0.13795	-0.03290	0.28032
11	0.62695	0.08877	0.04007
12	-0.06523	0.64161	0.03882
13	0.03123	0.06586	0.71304
14	-0.05724	-0.15150	0.12510
15	0.29981	-0.06779	-0.12899
16	0.54471	0.03509	-0.11589
17	-0.02873	0.76127	-0.04852
18	0.22761	0.02114	0.51380
19	0.67255	-0.06887	0.29820
20	0.11496	0.26555	-0.05374
21	0.74840	0.06856	0.09423
22	-0.06282	0.55031	0.07359
23	0.50555	0.05386	-0.06226
24	0.07394	0.65018	-0.06418
25	0.58807	0.08410	-0.05201

* + sign indicates high factor value when there is agreement with the positive expression of the attitude statement

** - sign indicates high factor value when there is agreement with the negative expression of the attitude statement

TABLES

TABLE 2

CLUSTER ANALYSIS BASED ON CORRELATION COEFFICIENTS FOR THE ATTITUDE SCALE

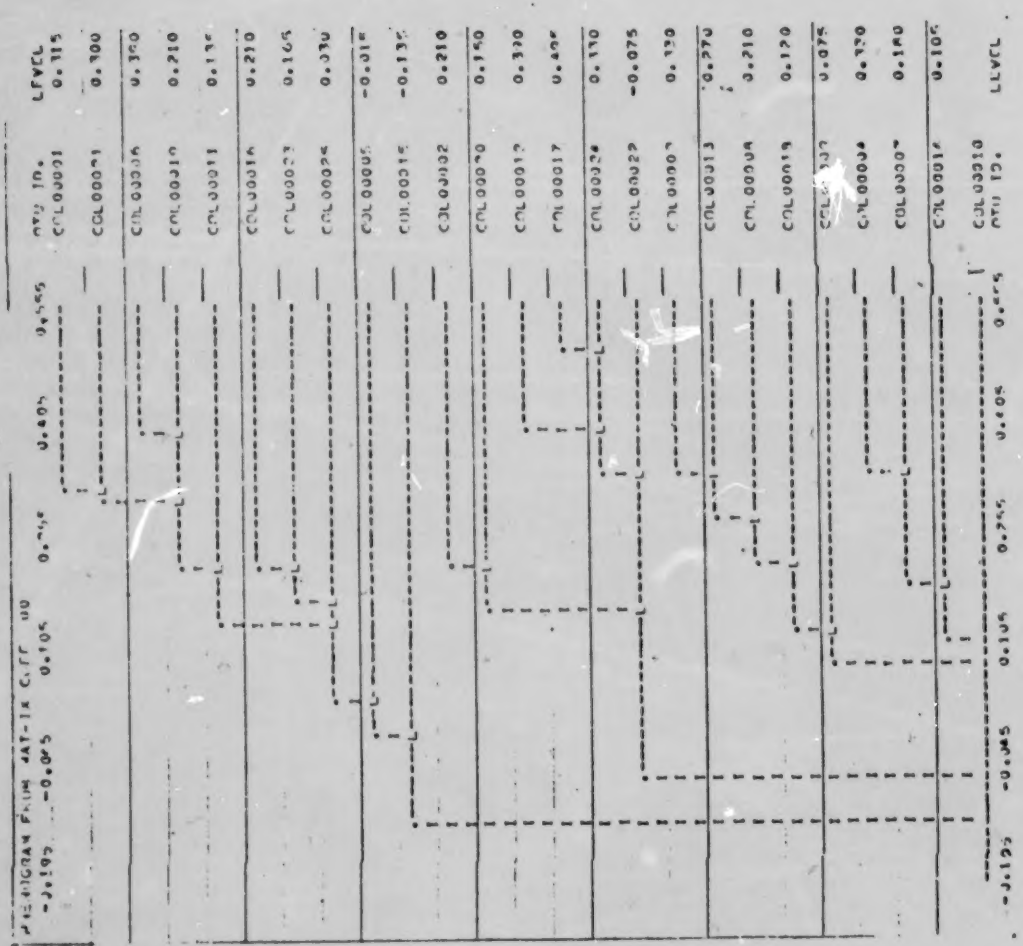


TABLE 3

CLUSTER ANALYSIS BASED ON DISTANCE
FOR THE ATTITUDE SCALE

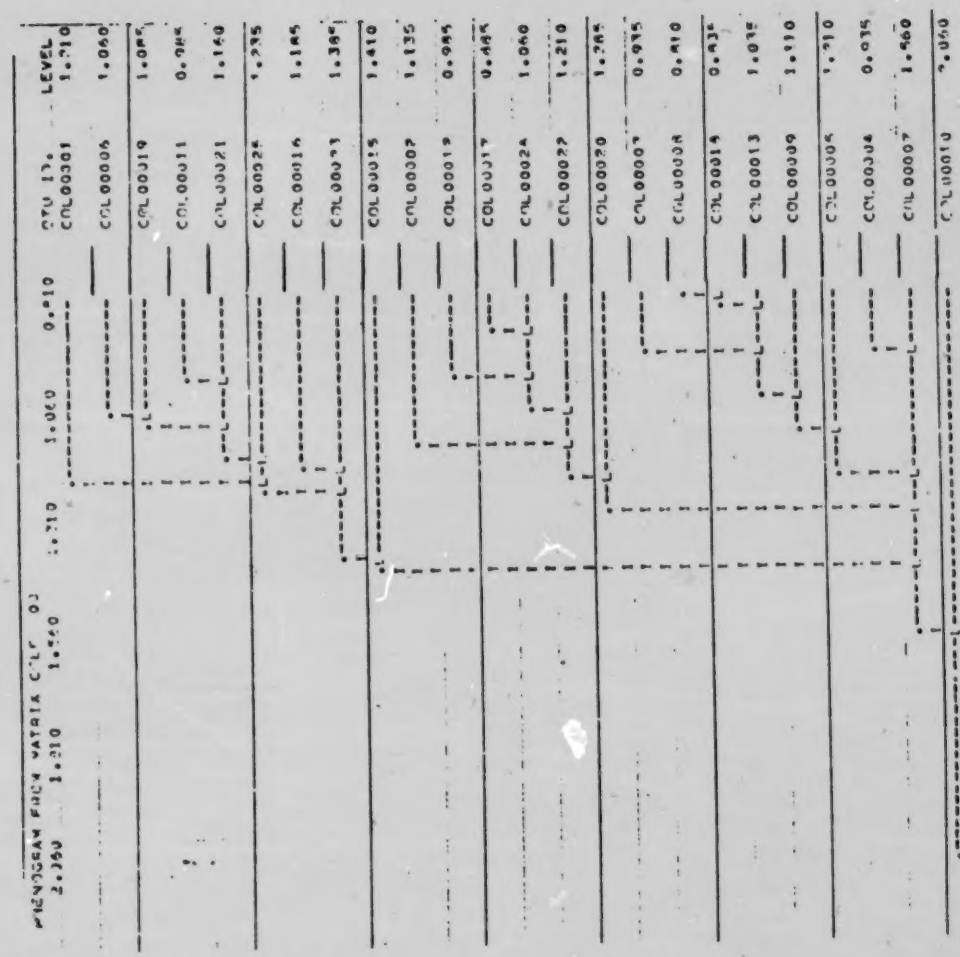


TABLE 4

VARIMAX ROTATED FACTOR MATRIX
AND FACTOR LOADINGS FOR FEMALES

Variable	Factor I	Factor II	Factor III
1	0.71263	0.21948	-0.04511
2	0.02230	-0.07337	0.25126
3	-0.09941	0.56189	-0.07743
4	-0.03533	0.25779	-0.00007
5	0.46536	-0.03840	0.12146
6	0.76315	0.10354	0.07561
7	0.04959	0.30841	-0.06505
8	0.15456	0.56085	-0.13427
9	0.07288	0.39017	0.04878
10	-0.12723	0.34259	-0.05427
11	0.71441	-0.00204	0.02016
12	-0.07620	0.16050	0.67271
13	0.01795	0.74121	0.17828
14	-0.08731	0.18867	-0.29987
15	0.35336	-0.14047	-0.03823
16	0.59848	-0.03955	0.19327
17	-0.01372	-0.02004	0.75303
18	0.20142	0.52147	0.02316
19	0.71635	0.37133	-0.04590
20	0.09080	-0.11569	0.31008
21	0.82202	0.11959	0.04704
22	-0.02111	0.19114	0.45304
23	0.59620	-0.02793	0.09993
24	0.30564	-0.05723	0.46290
25	0.58064	-0.03448	0.01777

* + sign indicates high factor value when there is agreement with the positive expression of the attitude statement

** - sign indicates high factor value when there is agreement with the negative expression of the attitude statement

TABLE 5

VARIMAX ROTATED FACTOR MATRIX AND
FACTOR LOADINGS FOR MALES

Variable	Factor I	Factor II	Factor III
1	0.66576	0.15957	-0.18941
2	0.02765	-0.02871	0.51287
3	0.01841	0.48331	0.09046
4	-0.03196	0.14775	-0.18195
5	0.36252	0.09888	0.22285
6	0.59857	0.25771	-0.08066
7	-0.03983	0.26591	-0.08372
8	0.13432	0.60446	-0.03992
9	0.07768	0.42882	0.01741
10	-0.14350	0.18451	-0.14053
11	0.53516	0.11295	0.05862
12	-0.01501	0.00067	0.47093
13	-0.00266	0.77373	0.06215
14	0.00500	0.01656	-0.10803
15	0.23839	-0.08730	-0.10843
16	0.48650	-0.18481	-0.04923
17	0.03283	0.03815	0.70869
18	0.22813	0.49600	0.07469
19	0.63173	0.23327	-0.09179
20	0.13895	0.01752	0.29950
21	0.67188	0.10803	0.07781
22	-0.06134	0.06764	0.38365
23	0.37956	-0.07832	0.07795
24	-0.11590	0.01598	0.70803
25	0.62633	-0.06494	0.10312

* + sign indicates high factor value when there is agreement with the positive expression of the attitude statement

** - sign indicates high factor value when there is agreement with the negative expression of the attitude statement

USE OF ANALYSIS OF VARIANCE/COVARIANCE TABLES

CODING	DEFINITION
SCH	School
SB(S)	Classes a and b within each school
SEX	Sex
SCHSEX	School x sex interaction
S(S)SX	Students within school x sex interaction
ERROR	Error term

USE OF TABLES FOR MARGINAL AND REMAINING TABLES

CODING	DEFINITION
VARIABLE 1	School
VARIABLE 2	Classes within school
VARIABLE 3	Sex

sex = 1 female
sex = 2 male

USE OF TABLES OF MARGINAL MEANS

School Codes

General Mathematics Classes	Code
Junior H.S. #2, Trenton	1
Churchill Jr. H.S., East Brunswick	2
Highland Park H.S., Highland Park	3
East Orange H.S., East Orange	4
North Plainfield H.S., North Plainfield	5
Grover Cleveland Jr. H.S., Caldwell	6
New Brunswick H.S., New Brunswick	7

Algebra Classes	Code
Junior H.S. #2, Trenton	1
Churchill Jr. H.S., East Brunswick	2
Alexander Hamilton Jr. H.S., Elizabeth	3
East Orange H.S., East Orange	4
North Plainfield H.S., North Plainfield	5
Grover Cleveland H.S., New Brunswick	6
New Brunswick H.S., New Brunswick	7
Highland Park H.S., Highland Park	8

TABLE 6

ANALYSIS OF VARIANCE FOR THE SUM OF THE ATTITUDES
FOR THE GENERAL MATHEMATICS STUDENTS

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	1190561.2776	1	1190561.00000	4795.64453
SCH	1774.43131	6	295.73855	1.93007
SE(S)	1078.79799	7	154.11397	1.52691
SEX	303.35728	1	303.35719	3.00565
SCHSEX	425.90642	6	70.98470	0.70329
S(S)SX	1220.18320	7	174.31186	1.72702
ERROR	17586.48634	170	103.33224	

TABLE 7

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND ACTUAL MEANS FOR THE SUM OF THE ATTITUDES FOR THE GENERAL MATHEMATICS STUDENTS

No. of Students	Cell Indices			Actual Mean
	School	Class	Sex	
11	1	1	1	87.09091
7	1	1	2	88.42857
12	1	2	1	87.25000
11	1	2	2	85.00000
8	2	1	1	80.62500
6	2	1	2	83.00000
4	2	2	1	87.75000
8	2	2	2	81.50000
9	3	1	1	79.55556
5	3	1	2	74.20000
9	3	2	1	89.00000
5	3	2	2	80.00000
7	4	1	1	95.57143
8	4	1	2	86.37500
6	4	2	1	88.16667
6	4	2	2	87.83333
7	5	1	1	88.85714
10	5	1	2	81.40000
5	5	2	1	73.80000
11	5	2	2	85.81818
7	6	1	1	81.42857
6	6	1	2	72.66667
5	6	2	1	84.20000
6	6	2	2	84.50000
2	7	1	1	88.00000
3	7	1	2	82.33333
8	7	2	1	81.75000
6	7	2	2	81.00000

TABLE 8

MARGINAL MEANS FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES WITH RESPECT TO ATTITUDE

MARGINAL MEANS

VARIABLE (SCHOOL)

LEVEL	
1	86.80484
2	82.99995
3	81.71425
4	89.48145
5	83.30299
6	80.45828
7	82.26311

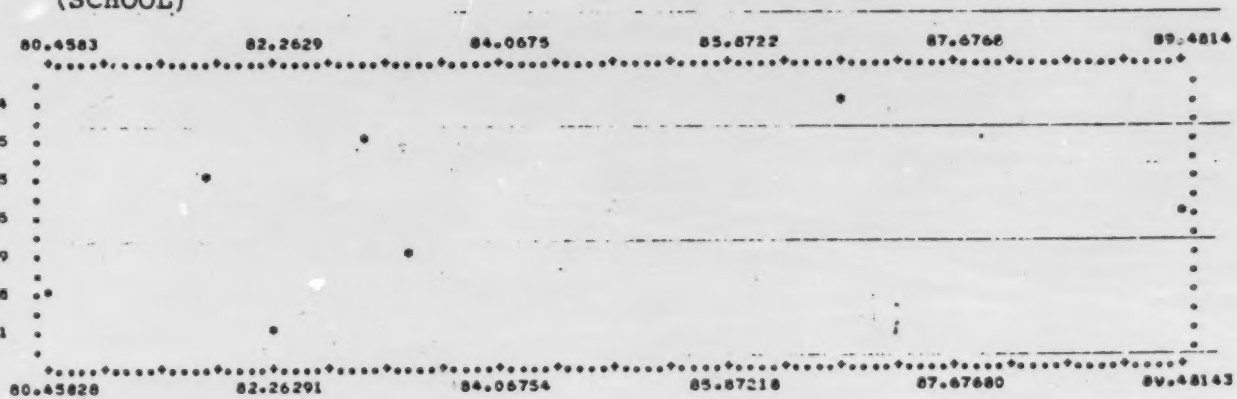


TABLE 9

MARGINAL MEANS FOR THE TWO GENERAL MATHEMATICS CLASSES WITHIN EACH OF THE SEVEN SCHOOLS WITH RESPECT TO ATTITUDE

MARGINAL MEANS

VARIABLE 2 (CLASSES WITHIN SCHOOL)

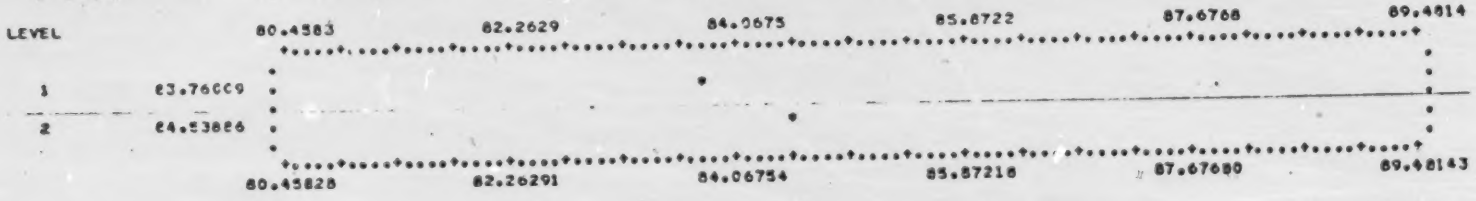


TABLE 10

MARGINAL MEANS FOR SEX OF STUDENTS WITHIN THE SEVEN SCHOOLS
HAVING INTACT GENERAL MATHEMATICS CLASSES
WITH RESPECT TO ATTITUDE

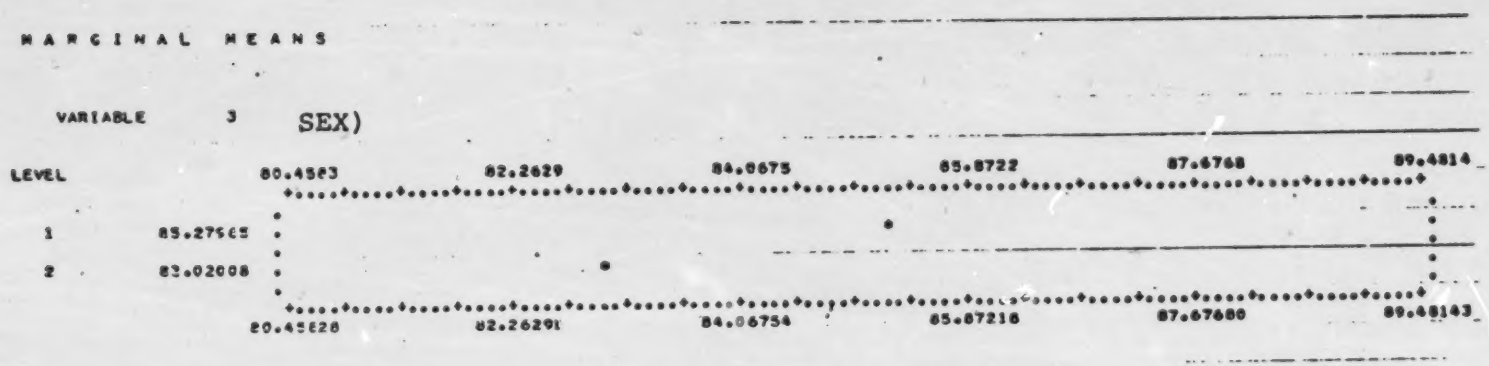


TABLE 11

A THREE WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

THREE WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
87.09090 88.42856
87.24998 84.99998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
80.62498 84.99998
87.74998 81.49998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
79.55554 74.20000
88.99998 79.99998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
95.57143 86.37498
88.16666 87.83333
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
88.85713 81.39999
73.79999 85.81818
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
81.42856 72.16666
84.20000 84.49998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
87.99998 82.33333
81.74998 80.99998

TABLE 12

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL)
DOWN x 3 SEX/ACROSS THE SEVEN SCHOOLS HAVING INTACT
GENERAL MATHEMATICS CLASSES

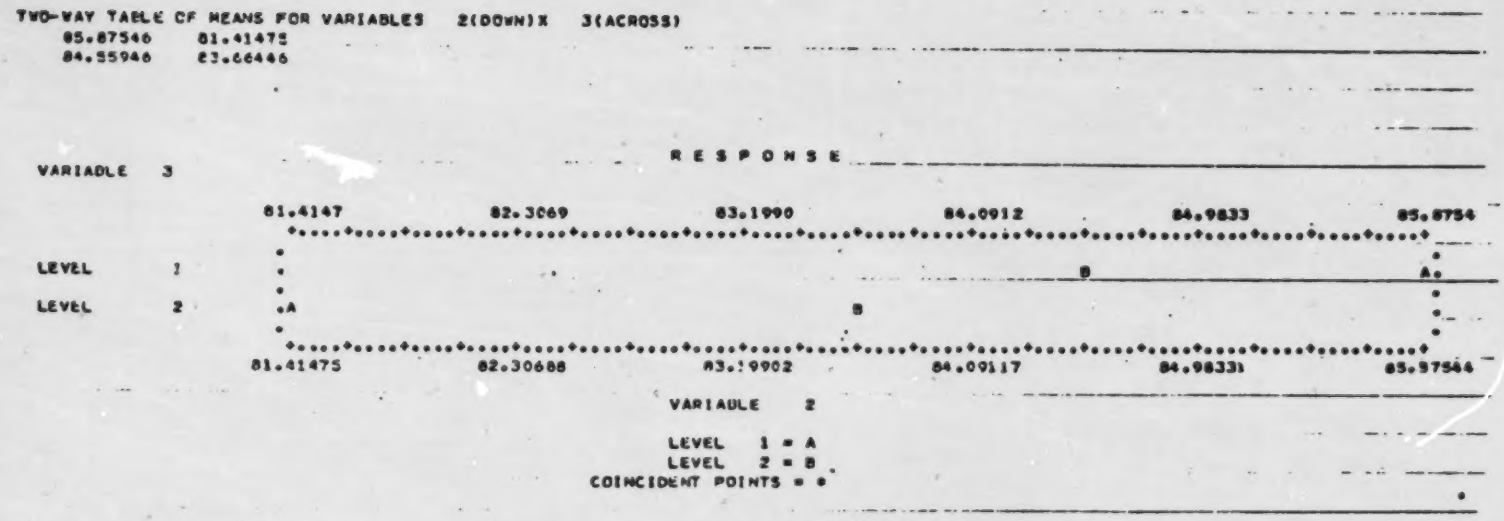


TABLE 13

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 1 (SCHOOL)/
DOWN x 3 (SEX)/ACROSS FOR THE SEVEN SCHOOLS
HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TAELE CF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

87.17043	86.71426
84.18747	83.24597
84.27776	77.09998
91.86903	87.10414
81.32855	83.60906
82.81427	78.33331
84.87497	81.66664

RESPONSE

VARIABLE 3

77.1000 80.0538 83.0076 85.9614 88.9152 91.8690

LEVEL 1 E F BC G A D

LEVEL 2 C F G B E A D

77.09998 80.05377 83.00758 85.96140 88.91521 91.86902

VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G

COINCIDENT POINTS = *

TABLE 14

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 2 (CLASSES WITHIN SCHOOL) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

```
TWO-WAY TAELE OF MEANS FOR VARIABLES   1(DOWN) X   2(ACROSS)
    87.75972     86.12497
    87.8:247     84.62457
    76.87776     84.42987
    90.97316     87.59458
    85.12856     75.80908
    76.79761     84.34598
    85.16064     81.37497

                                    R E S P O N S E

VARIABLE   2

                 76.797      79.6327      82.4678      85.3029      88.1381      90.9732
                   +....+....+....+....+....+....+....+....+....+....+....+....+....+....+
                   .                                                                    .
LEVEL      1       .FC                        B            *           A              D.
                   .                                                                    .
LEVEL      2       .          E       G                FCB       A        D           .
                   .                                                                    .
                   +....+....+....+....+....+....+....+....+....+....+....+....+....+....+
                 76.79761    79.63272     82.46783     85.30295     88.13806     90.97318

                                    VARIABLE   1

                                    LEVEL   1 = A
                                    LEVEL   2 = B
                                    LEVEL   3 = C
                                    LEVEL   4 = D
                                    LEVEL   5 = E
                                    LEVEL   6 = F
                                    LEVEL   7 = G
                                 COINCIDENT POINTS = *
```

TABLE 15

ANALYSIS OF VARIANCE FOR THE SUM OF THE ATTITUDES FOR THE ALGEBRA STUDENTS

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	2179143.95038	1	2179143.00000	21983.37500
SCH	884.81343	7	126.40189	1.27515
SB(S)	1393.70494	8	174.21310	1.75748
SEX	166.45755	1	166.45755	1.67924
SCHSEX	487.18204	7	69.59741	0.70210
S(S)SX	748.41037	8	93.58678	0.94413
ERROR	31026.71309	313	99.12686	

TABLE 16

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND ACTUAL MEANS FOR THE SUM OF THE ATTITUDES FOR THE ALGEBRA STUDENTS

No. of Students	Cell Indices			Actual Mean
	School	Class	Sex	
16	1	1	1	85.50000
13	1	1	2	85.84615
21	1	2	1	94.80952
10	1	2	2	88.40000
13	2	1	1	82.38462
5	2	1	2	85.60000
12	2	2	1	93.16667
14	2	2	2	87.64286
12	3	1	1	86.75000
17	3	1	2	86.70588
19	3	2	1	86.31579
7	3	2	2	86.57143
9	4	1	1	89.44444
6	4	1	2	88.00000
11	4	2	1	85.18182
16	4	2	2	88.31250
4	5	1	1	83.50000
18	5	1	2	83.27778
8	5	2	1	91.12500
10	5	2	2	86.00000
9	6	1	1	82.33333
15	6	1	2	81.20000
9	6	2	1	86.22222
14	6	2	2	85.64286
10	7	1	1	91.90000
6	7	1	2	90.33333
8	7	2	1	84.50000
4	7	2	2	90.50000
8	8	1	1	89.37500
8	8	1	2	87.37500
6	8	2	1	96.16667
7	8	2	2	82.85714

TABLE 17

MARGINAL MEANS FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES WITH RESPECT TO ATTITUDE

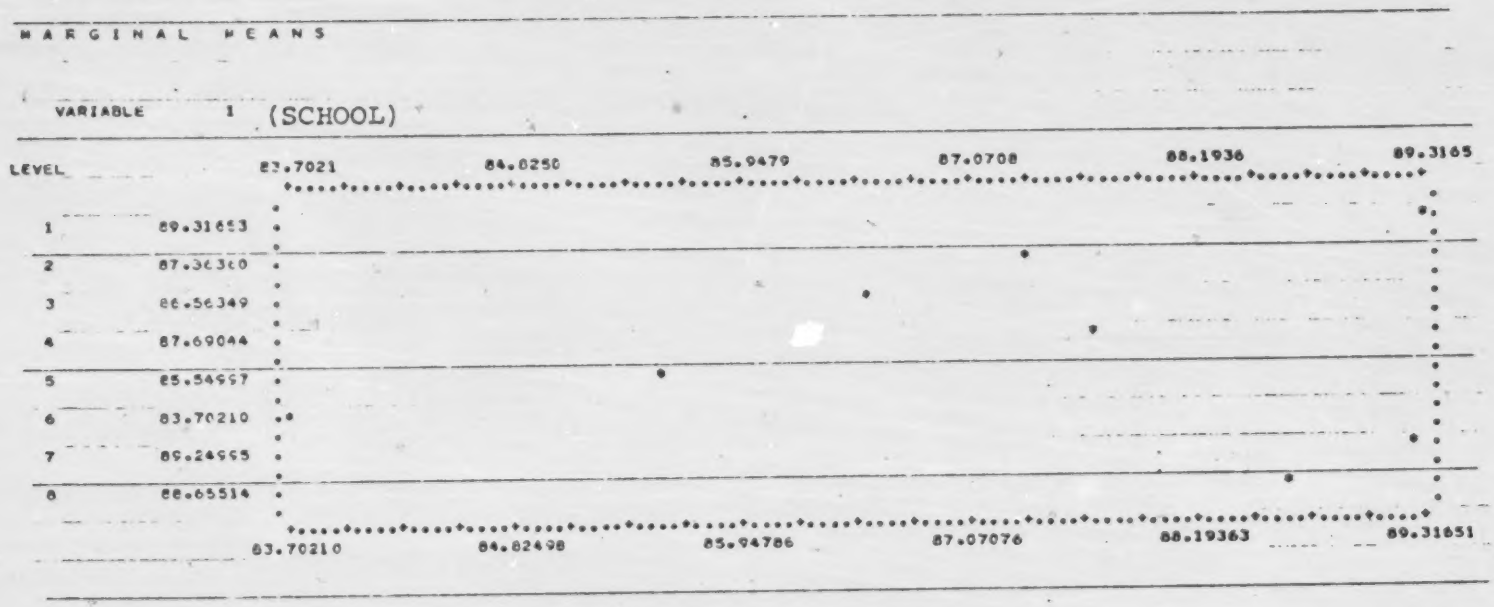


TABLE 18

MARGINAL ATTITUDINAL MEANS FOR THE TWO ALGEBRA CLASSES WITHIN EACH OF THE EIGHT SCHOOLS

MARGINAL MEANS

VARIABLE 2 (CLASSES WITHIN SCHOOL)

LEVEL		63.7021	84.8250	85.9479	87.0708	88.1936	89.3165
1	85.78670	•		•		•	•
2	88.49402	•			•		•
		63.70210	84.82498	85.94786	87.07074	88.19363	89.31651

TABLE 19

MARGINAL ATTITUDINAL MEANS FOR SEX OF STUDENTS WITHIN THE RESPECTIVE ALGEBRA CLASSES WITHIN EACH OF THE EIGHT SCHOOLS

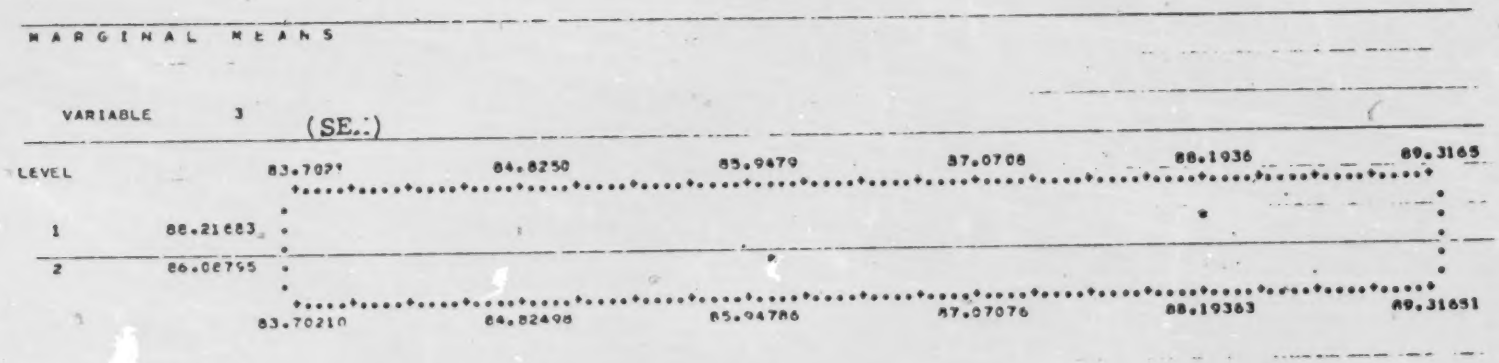


TABLE 20

A THREE-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

THREE-WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
85.49998 85.84615
94.80951 88.39999
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
82.38461 85.59999
93.16666 87.64285
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
86.74998 86.70587
86.31578 85.57143
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
89.44444 87.99998
85.18181 88.31248
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
83.49998 83.27777
91.12198 85.99998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
82.33333 81.20000
86.22221 85.64285
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
91.89999 90.33333
84.49998 90.49998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 8.
89.37498 87.37498
96.16666 82.85713

TABLE 21

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL) DOWN x 3 SEX/ACROSS EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

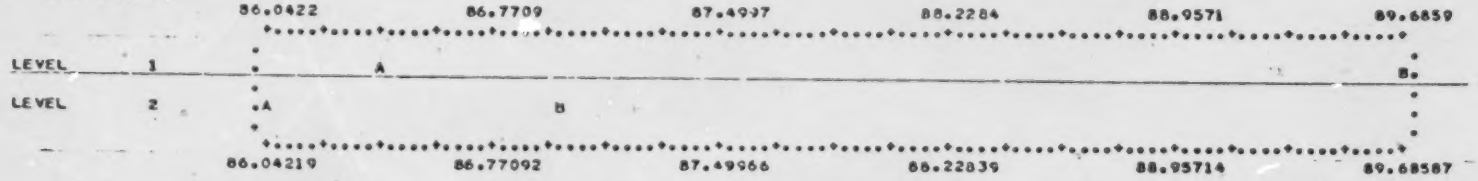
TWO-WAY TABLE OF MEANS FOR VARIABLES 2(DOWN)X 3(ACROSS)

86.39833 86.04219

89.68588 86.95078

RESPONSE

VARIABLE 3



VARIABLE 2

LEVEL 1 = A
LEVEL 2 = B
COINCIDENT POINTS = *

TABLE 22

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 1 (SCHOOL)/DOWN
x 3 (SEX)/ACROSS FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

90.15474	87.12306
87.77563	86.69141
86.53287	86.63804
87.31311	88.15622
87.31247	84.63887
84.27776	83.42142
88.19958	90.41864
92.77081	85.11604

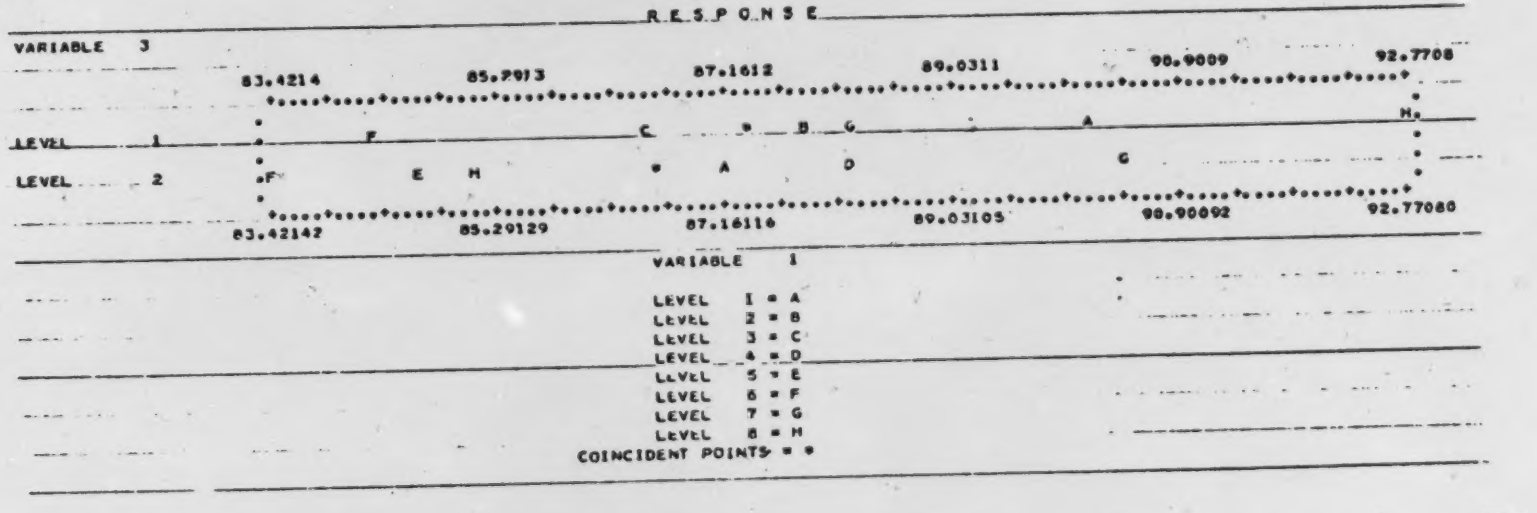


TABLE 23

TWO-WAY TABLE OF ATTITUDINAL MEANS FOR VARIABLES 1 (SCHOOL)/DOWN
x 2 (CLASSES WITHIN SCHOOL) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 2(ACROSS)

85.67305	91.60475
82.99229	90.40475
86.72792	86.44359
88.72220	86.74713
83.38887	88.56247
81.76665	85.53253
91.11665	87.49597
88.37497	89.51189

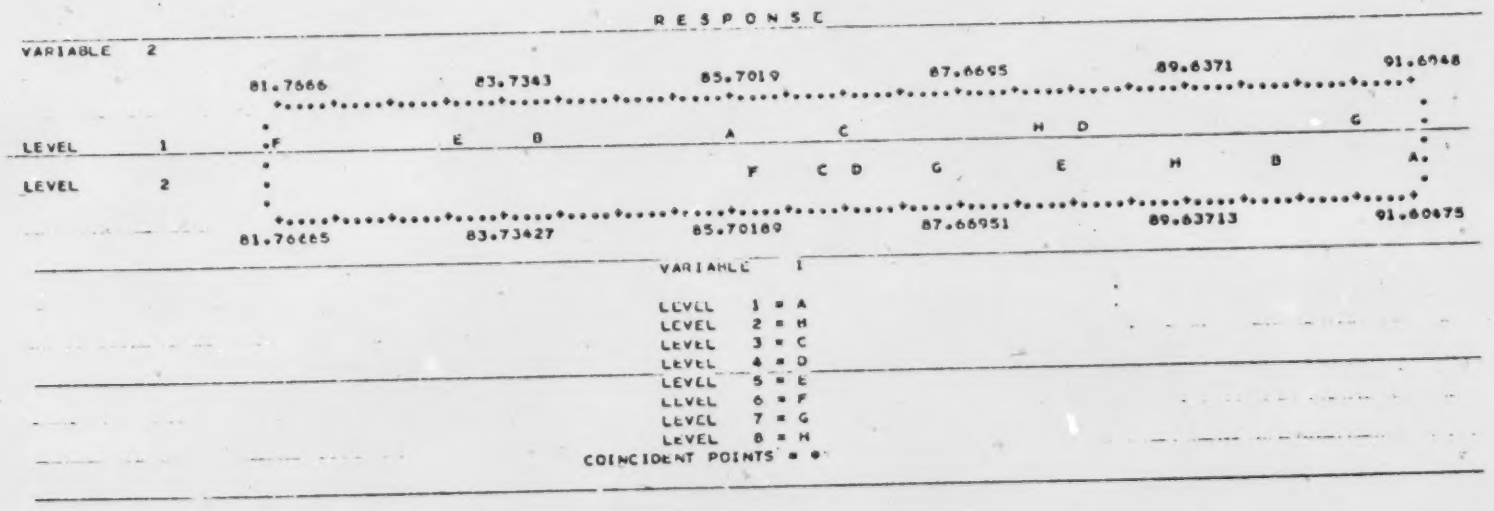


TABLE 24

ANALYSIS OF VARIANCE FOR THE SUM OF THE ACHIEVEMENT FOR THE GENERAL MATHEMATICS STUDENTS

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	30872.83811	1	30872.83594	1434.34448
SCH	1446.62633	6	241.10437	11.20165
SB(S)	583.99331	7	83.42758	3.87603
SEX	3.98608	1	3.98608	0.18519
SCHSEX	61.19697	6	10.19949	0.47387
S(S)SX	66.18742	7	9.45534	0.43929
ERROR	3659.08139	170	21.52400	

TABLE 25

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND ACTUAL MEANS FOR THE SUM OF THE ACHIEVEMENT FOR THE GENERAL MATHEMATICS STUDENTS

No. of Students	Cell Indices: School	Class	Sex	Actual Mean
11	1	1	1	11.27273
7	1	1	2	12.57143
12	1	2	1	13.75000
11	1	2	2	14.27273
8	2	1	1	17.00000
6	2	1	2	17.66667
4	2	2	1	18.25000
8	2	2	2	17.75000
9	3	1	1	15.00000
5	3	1	2	13.40000
9	3	2	1	18.33333
5	3	2	2	16.40000
7	4	1	1	6.71429
8	4	1	2	6.50000
6	4	2	1	10.16667
6	4	2	2	8.66667
7	5	1	1	15.85714
10	5	1	2	13.90000
5	5	2	1	13.00000
11	5	2	2	15.45455
7	6	1	1	8.85714
6	6	1	2	10.50000
5	6	2	1	18.00000
6	6	2	2	18.16667
2	7	1	1	9.00000
3	7	1	2	14.00000
8	7	2	1	1.75000
6	7	2	2	12.00000

TABLE 26

MARGINAL ACHIEVEMENT MEANS FOR THE SEVEN SCHOOLS
HAVING INTACT GENERAL MATHEMATICS CLASSES

MARGINAL MEANS

VARIABLE 1 (SCHOOL)

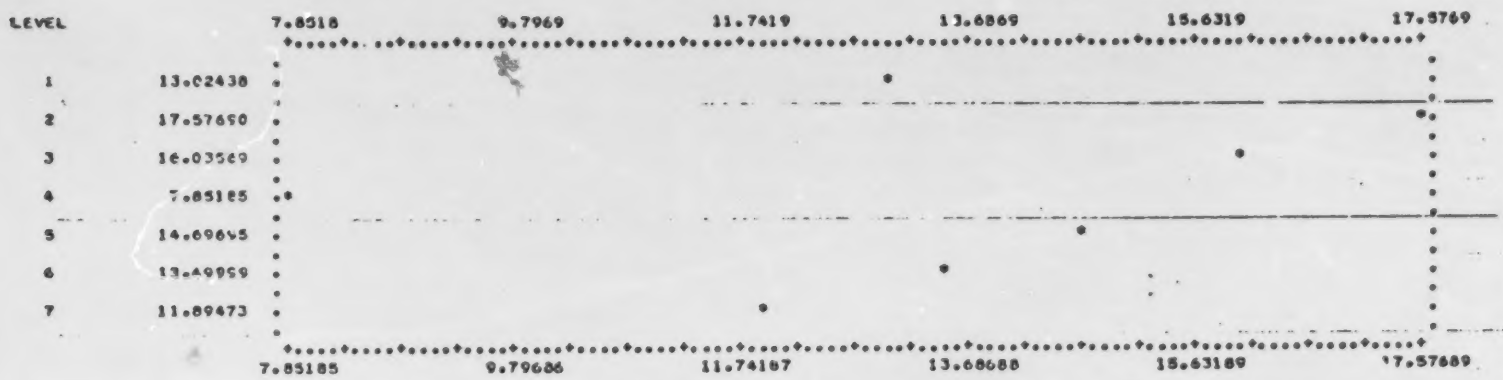


TABLE 27

MARGINAL ACHIEVEMENT MEANS FOR THE TWO GENERAL MATHEMATICS CLASSES WITHIN EACH OF THE SEVEN SCHOOLS

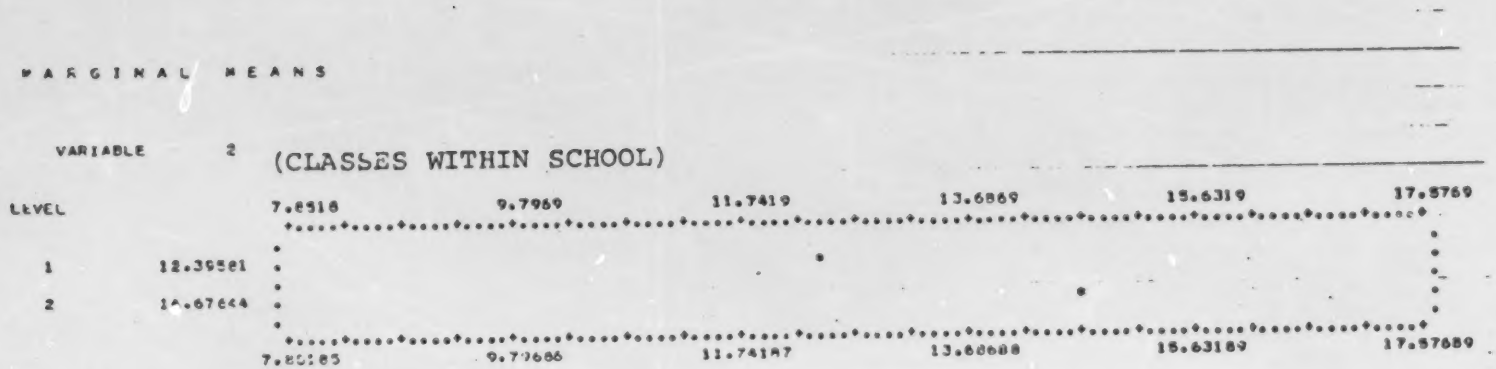


TABLE 28

MARGINAL ACHIEVEMENT MEANS FOR SEX OF STUDENTS WITHIN THE RESPECTIVE GENERAL MATHEMATICS CLASSES WITHIN EACH OF THE SEVEN SCHOOLS

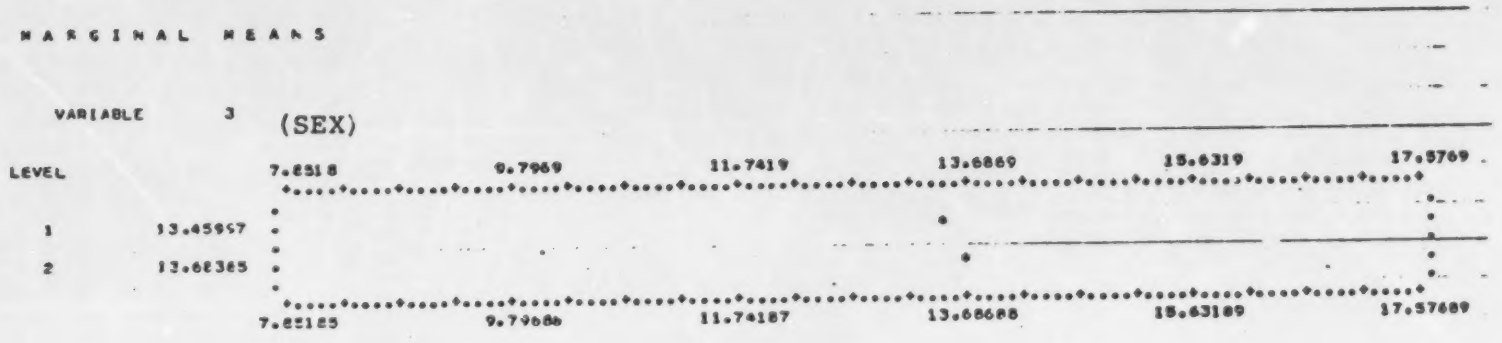


TABLE 29

A THREE-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

THREE-WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
11.27273 12.57143
13.75000 14.27273
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
16.99998 17.66666
18.24998 17.74998
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
15.00000 13.40000
18.33333 16.39999
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
6.71428 6.50000
10.16667 8.66667
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
15.85714 13.90000
13.00000 15.45455
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
8.85714 10.50000
17.99998 18.16666
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
9.00000 14.00000
11.75000 12.00000

TABLE 30

TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL) DOWN x 3 SEX/ACROSS SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

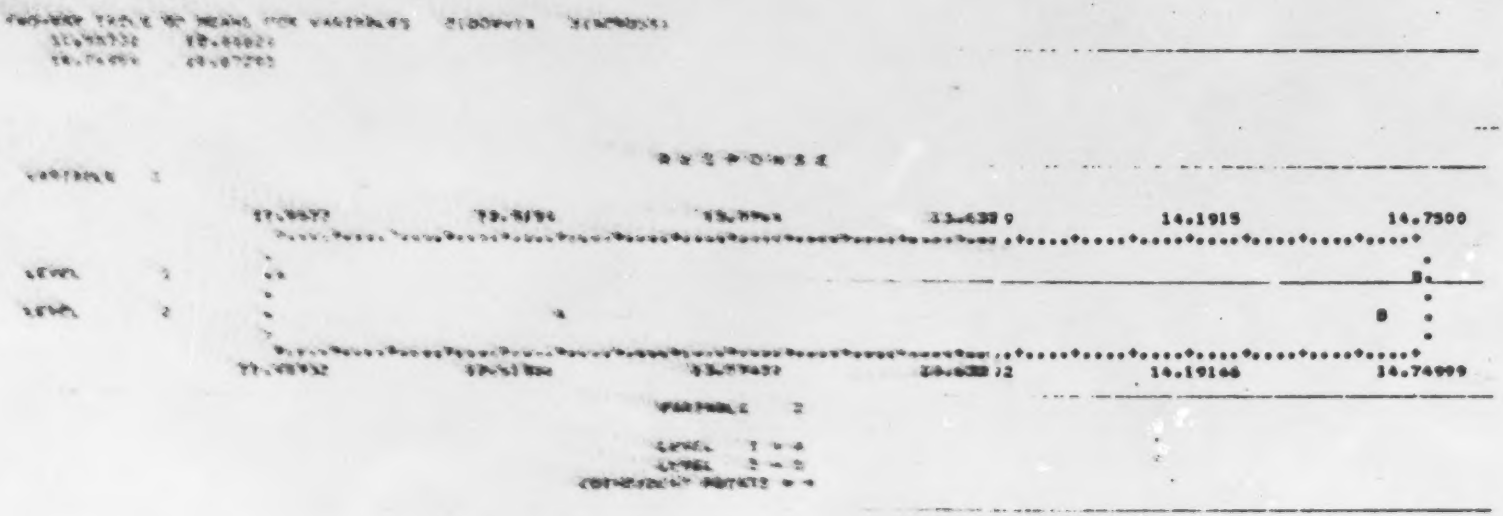


TABLE 31

TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 3 (SEX)/ACROSS FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

12.51136	13.42208
17.62458	17.70831
16.66666	14.50000
8.44048	7.58333
14.42857	14.67727
13.42856	14.33333
10.37500	12.00000

RESPONSE

VARIABLE 3

7.5833 9.6083 11.6333 13.6583 15.6833 17.7083

LEVEL 1 D G A F E C B

LEVEL 2 D G A F E C B

7.58333 9.60833 11.63332 13.65832 15.68331 17.70830

VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
COINCIDENT POINTS = *

TABLE 32

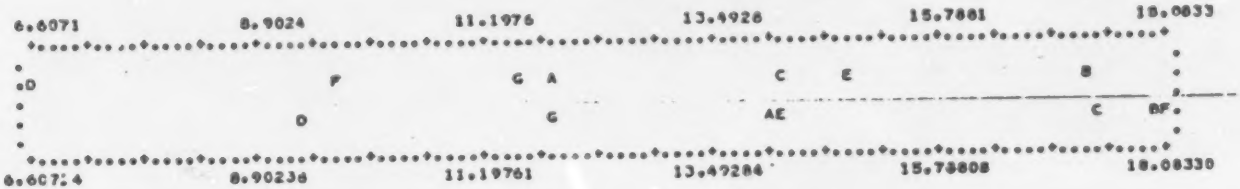
TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 2 (CLASSES WITHIN SCHOOL) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 2(ACROSS)

11.92208	14.01136
17.33331	17.64558
14.20000	17.36665
6.60714	9.46667
14.67857	14.22727
9.67857	18.08331
11.50000	11.87500

RESPONSE

VARIABLE 2



VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
COINCIDENT POINTS = *

TABLE 33

ANALYSIS OF VARIANCE FOR THE SUM OF THE ACHIEVEMENT FOR THE ALGEBRA CLASSES

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	133673.46567	1	133673.43750	5194.31641
SCH	3920.28749	7	560.04102	21.76221
SB(S)	2222.03439	8	277.75415	10.79304
SEX	60.47165	1	60.47163	2.34982
SCHSEX	323.30350	7	46.18620	1.79471
S(S)SX	82.61510	8	10.32689	0.40128
ERROR	8054.92145	313	25.73456	

TABLE 34

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND ACTUAL MEANS FOR THE SUM OF THE ACHIEVEMENT FOR THE ALGEBRA STUDENTS

No. of Students	Cell Indices: School	Class	Sex	Actual Mean
16	1	1	1	16.68750
13	1	1	2	16.30769
21	1	2	1	27.76190
10	1	2	2	27.40000
13	2	1	1	21.76923
5	2	1	2	23.00000
12	2	2	1	21.16667
14	2	2	2	24.50000
12	3	1	1	22.91667
17	3	1	2	21.70588
19	3	2	1	22.36842
7	3	2	2	24.57143
9	4	1	1	11.[illegible]889
6	4	1	2	11.83333
11	4	2	1	14.63636
16	4	2	2	11.62500
4	5	1	1	23.75000
18	5	1	2	21.38889
8	5	2	1	20.37500
10	5	2	2	19.10000
9	6	1	1	22.55556
15	6	1	2	23.40000
9	6	2	1	26.77778
14	6	2	2	27.57143
10	7	1	1	17.40000
6	7	1	2	22.50000
8	7	2	1	22.25000
4	7	2	2	29.50000
8	8	1	1	22.87500
8	8	1	2	25.25000
6	8	2	1	23.33333
7	8	2	2	23.57143

TABLE 35

MARGINAL ACHIEVEMENT MEANS FOR THE EIGHT SCHOOLS
HAVING INTACT ALGEBRA CLASSES

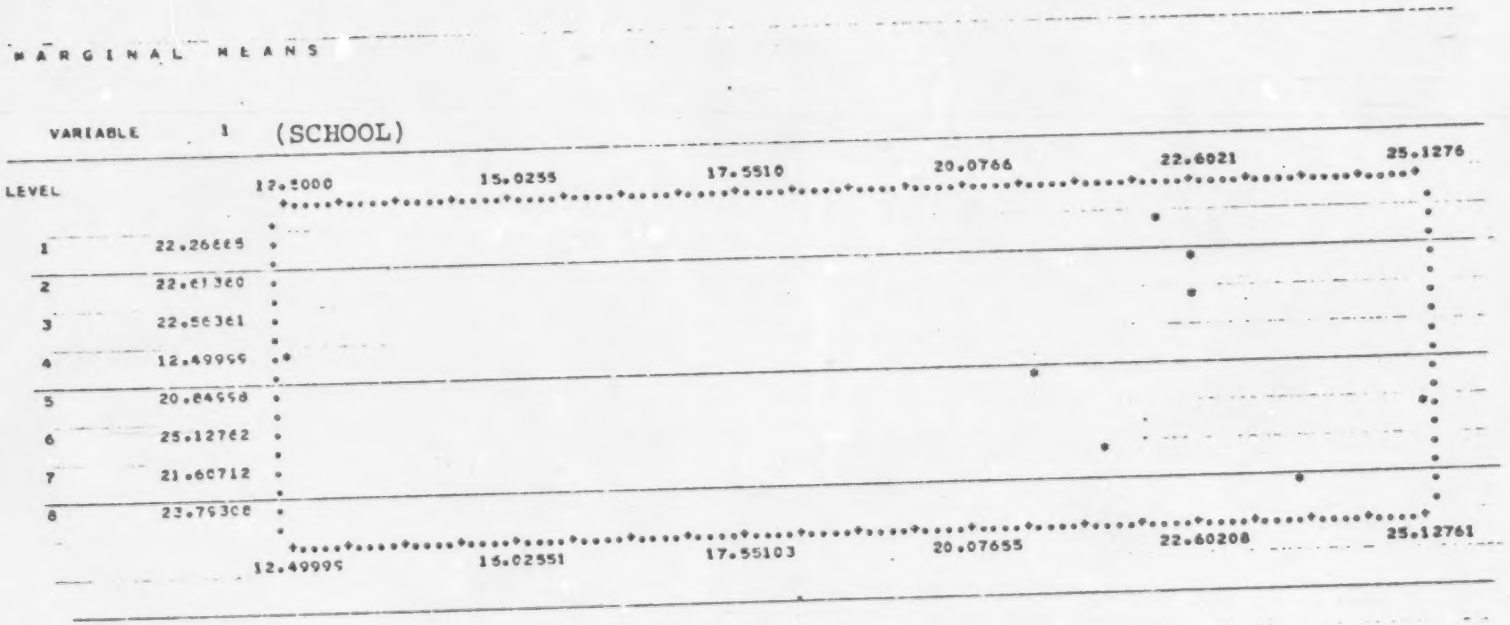


TABLE 36

MARGINAL ACHIEVEMENT MEANS FOR THE TWO ALGEBRA CLASSES WITHIN EACH OF THE EIGHT SCHOOLS

MARGINAL MEANS

VARIABLE 2 (CLASSES WITHIN SCHOOL)

LEVEL		12.5000	15.0255	17.5510	20.0766	22.6021	25.1276
1	20.27806	•			•		•
2	22.61360	•				•	•
		12.49999	15.02551	17.55103	20.07655	22.60208	25.12761

TABLE 37

MARGINAL ACHIEVEMENT MEANS FOR SEX OF STUDENTS
WITHIN THE RESPECTIVE ALGEBRA CLASSES
WITHIN EACH OF THE EIGHT SCHOOLS

MARGINAL MEANS

VARIABLE 3 (SEX)

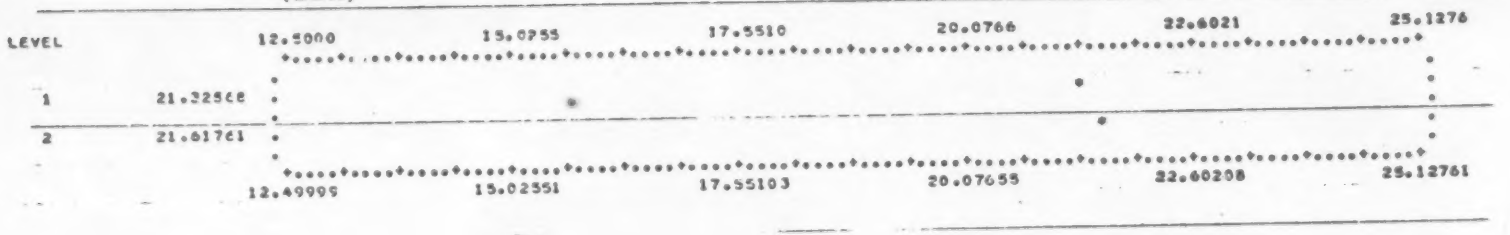


TABLE 38

A THREE-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

THREE-WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
16.68748 16.30768
27.76190 27.39999
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
21.76923 22.99998
21.16666 24.49998
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
22.91666 21.70587
22.36841 24.57143
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
11.88889 11.83333
14.63636 11.62500
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
23.74998 21.38889
20.37498 19.09999
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
22.55554 23.39999
26.77777 27.57143
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
17.39999 22.49998
22.24998 29.49998
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 8.
22.87498 25.24998
23.33333 23.57143

TABLE 39

TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL) DOWN x 3 SEX/ACROSS SEVEN SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 2(DOWN) X 3(ACROSS)

19.98033 20.67316

22.23365 23.47587

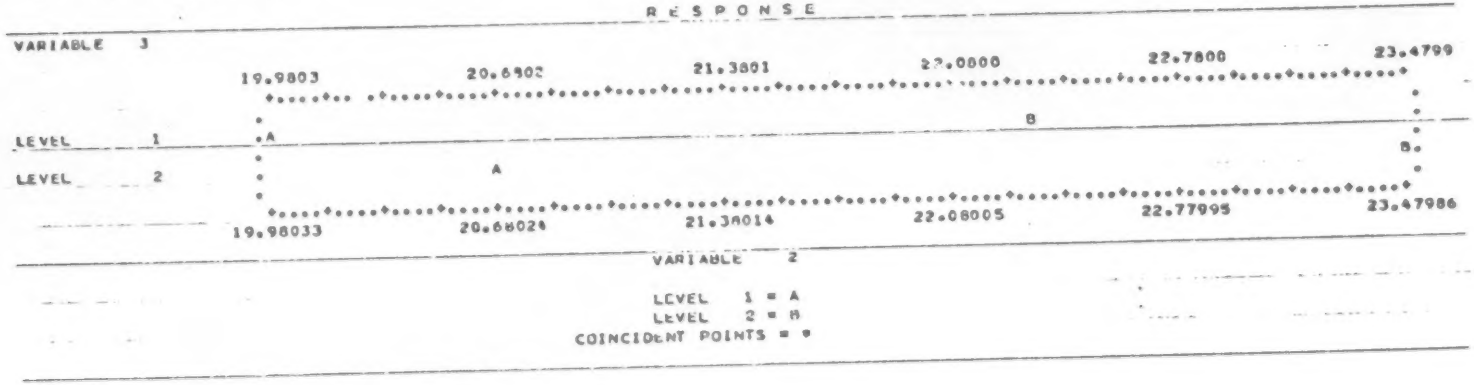


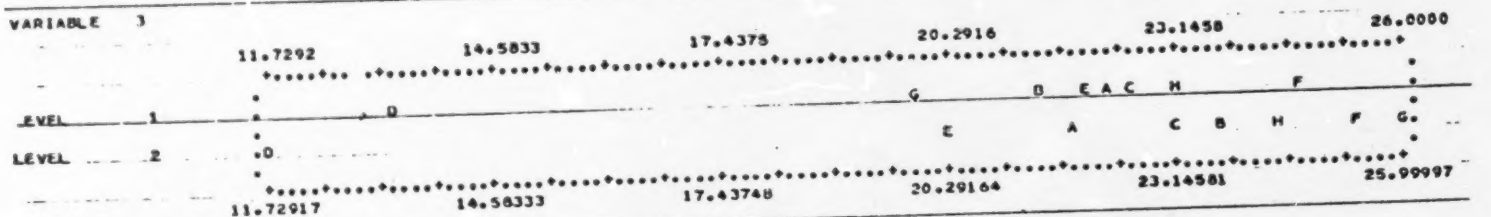
TABLE 40

TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 1 (SCHOOL)/DOWN
x 3 (SEX)/ACROSS FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

22.22469	21.85384
21.46794	23.74998
22.64253	23.13864
13.26262	11.72917
22.06248	20.24443
24.66666	25.46570
19.82498	25.55598
23.10416	24.41371

RESPONSE



VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
LEVEL 8 = H
COINCIDENT POINTS = *

TABLE 41

TWO-WAY TABLE OF ACHIEVEMENT MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 2 (CLASSES WITHIN SCHOOL) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN) X 2(ACROSS)

16.49757	27.58095
22.38460	22.83331
22.31126	23.46491
11.86111	13.13066
27.56943	19.72749
22.97777	27.17459
19.64960	25.17498
24.06248	23.45238

RESPONSE

VARIABLE 2

11.8611 15.0091 18.1490 21.2930 24.4370 27.5809

LEVEL 1 D A G C B E F H

LEVEL 2 D E B * G F A

11.86111 15.00908 18.14903 21.29300 24.43697 27.58093

VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
LEVEL 8 = H
COINCIDENT POINTS = *

TABLE 42

ANALYSIS OF COVARIANCE FOR THE GENERAL MATHEMATICS STUDENTS

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	0.05804	1	0.05804	0.00306
SCH	1758.44117	6	293.07349	15.45938
SB(S)	454.84358	7	64.97763	3.42752
SEX	22.95728	1	22.95728	1.21098
SCHSEX	47.85716	6	7.97619	0.42074
S(S)SX	56.66979	7	8.09568	0.42704
COVS	455.23755	1	455.23755	24.01340
COV. 1	455.23755	1	455.23755	24.01340
ERROR	3203.84362	169	18.95764	

TABLE 43

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND PREDICTED MEAN FOR THE GENERAL MATHEMATICS STUDENTS

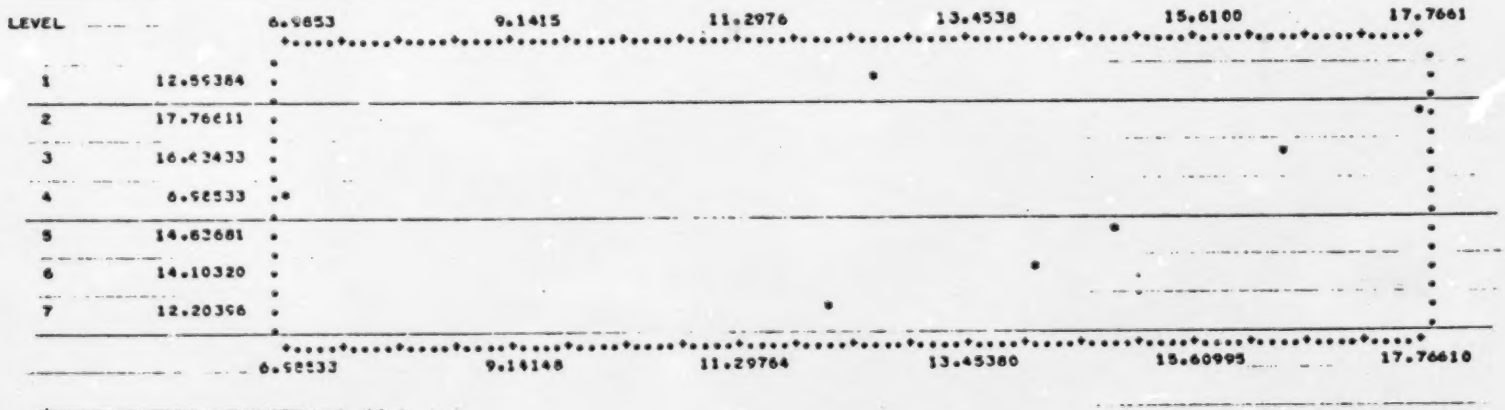
No. of Students	Cell Indices: School	Class	Sex	Predicted Mean
11	1	1	1	10.79559
7	1	1	2	11.87641
12	1	2	1	13.24695
11	1	2	2	14.13617
8	2	1	1	17.57606
6	2	1	2	17.53011
4	2	2	1	17.66551
8	2	2	2	18.18354
9	3	1	1	15.75026
5	3	1	2	15.02259
9	3	2	1	17.54524
5	3	2	2	17.07786
7	4	1	1	4.85580
8	4	1	2	6.13947
6	4	2	1	9.51431
6	4	2	2	8.06860
7	5	1	1	15.09231
10	5	1	2	14.34982
5	5	2	1	14.68775
11	5	2	2	15.18472
7	6	1	1	9.30231
6	6	1	2	12.45379
5	6	2	1	17.99375
6	6	2	2	18.11155
2	7	1	1	8.37479
3	7	1	2	14.29780
8	7	2	1	12.14281
6	7	2	2	12.51498

TABLE 44

MARGINAL MEANS FOR THE SEVEN SCHOOLS HAVING
INTACT GENERAL MATHEMATICS CLASSES

MARGINAL MEANS

VARIABLE 1 (SCHOOL)



103

TABLE 45

MARGINAL MEANS FOR THE TWO GENERAL MATHEMATICS CLASSES WITHIN EACH OF THE SEVEN SCHOOLS

MARGINAL MEANS

VARIABLE 2 (CLASSES WITHIN SCHOOL)

LEVEL		6.9853	9.1415	11.2976	13.4538	15.6100	17.7661
1	12.46116			•			
2	14.61465				•		
		6.98533	9.14148	11.29764	13.45380	15.60995	17.76610

75

TABLE 46

MARGINAL MEANS FOR SEX OF STUDENTS WITHIN THE RESPECTIVE GENERAL MATHEMATICS CLASSES WITHIN EACH OF THE SEVEN SCHOOLS

MARGINAL MEANS

VARIABLE 3 (SEX)

LEVEL		6.9853	9.1415	11.2976	13.4536	15.6100	17.7661
1	13.27781				*		
2	13.86554						

6.98533 9.14148 11.29764 13.45380 15.60995 17.76610

TABLE 47

A THREE-WAY TABLE OF MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

THREE-WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
10.79559 11.87641
13.24695 14.13617
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
17.57605 17.53011
17.66550 18.18353
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
15.75026 15.02259
17.54523 17.07785
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
4.85580 6.13947
9.51431 8.06860
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
15.09231 14.34982
14.68775 15.18472
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
9.30231 12.45379
17.99374 18.11154
VARIABLES 2(DOWN) X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
8.37479 14.29780
12.14291 12.51498

TABLE 48

TWO-WAY TABLE OF MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL) DOWN x 3 SEX/ACROSS SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 2(DOWN)X 3(ACROSS)

11.67816 13.05571
14.68518 14.75391

RESPONSE

VARIABLE 3

11.6782 12.2933 12.9085 13.5236 14.1388 14.7539

LEVEL 1 A B
LEVEL 2 A B

11.67816 12.29331 12.90846 13.52361 14.13876 14.75391

VARIABLE 2

LEVEL 1 = A
LEVEL 2 = B
COINCIDENT POINTS = *

TABLE 49

TWO-WAY TABLE OF MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 3 (SEX)/ACROSS
FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

12.02127	13.03629
17.62077	17.05691
16.64774	16.05022
7.18505	7.10404
14.89003	14.76727
13.64803	15.78767
10.25880	13.40639

RESPONSE

VARIABLE 3

7.1040 9.2546 11.4051 13.5557 15.7063 17.8568

LEVEL 1 D G A F E C B

LEVEL 2 D A G E F C B

7.10404 9.25459 11.40515 13.55570 15.70625 17.85680

VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
COINCIDENT POINTS = *

TABLE 50

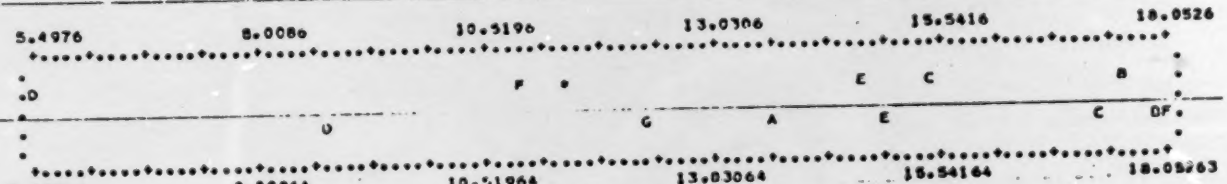
TWO-WAY TABLE OF MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 2 (CLASSES WITHIN SCHOOL) FOR THE SEVEN SCHOOLS HAVING INTACT GENERAL MATHEMATICS CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 2(ACROSS)

11.33600	13.69156
17.55307	17.62451
15.38642	17.31154
5.49764	8.79145
14.72107	14.53623
10.87803	18.05264
11.33629	12.32890

RESPONSE

VARIABLE 2



VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
COINCIDENT POINTS = *

TABLE 51

ANALYSIS OF COVARIANCE FOR THE ALGEBRA STUDENTS

ANALYSIS OF VARIANCE TABLE

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F
MEAN	294.81997	1	294.81982	12.49537
SCH	4078.67518	7	582.66772	24.69524
SE(S)	1982.69471	8	247.83682	10.50408
SEX	93.68862	1	93.68861	3.97081
SCHSEX	304.63099	7	43.51869	1.84445
S(S)SX	102.71268	8	12.83908	0.54416
COVS	693.48421	1	693.48413	29.39197
COV. 1	693.48413	1	693.48413	29.39197
ERROR	7381.43725	312	23.59433	

TABLE 52

PRESENTATION OF NUMBER OF STUDENTS PER CLASS, CELL INDICES AND PREDICTED MEAN FOR THE ALGEBRA STUDENTS

No. of Students	Cell Indices: School	Class	Sex	Predicted Mean
16	1	1	1	16.93689
13	1	1	2	16.50533
21	1	2	1	26.61949
10	1	2	2	27.21583
13	2	1	1	22.48438
5	2	1	2	23.23444
12	2	2	1	20.26986
14	2	2	2	24.42902
12	3	1	1	22.97918
17	3	1	2	21.77499
19	3	2	1	22.49585
7	3	2	2	24.66064
9	4	1	1	11.54857
6	4	1	2	11.70896
11	4	2	1	14.93332
16	4	2	2	11.45391
4	5	1	1	24.29839
18	5	1	2	21.97051
8	5	2	1	19.78343
10	5	2	2	19.27464
9	6	1	1	23.27837
15	6	1	2	24.29225
9	6	2	1	26.91919
14	6	2	2	27.79946
10	7	1	1	16.69257
6	7	1	2	22.02679
8	7	2	1	22.64889
4	7	2	2	29.00187
8	8	1	1	22.54506
8	8	1	2	25.21907
6	8	2	1	21.98802
7	8	2	2	24.21593

TABLE 53

MARGINAL MEANS FOR THE EIGHT SCHOOLS
HAVING INTACT ALGEBRA CLASSES

MARGINAL MEANS

VARIABLE 1 (SCHOOL)

LEVEL		12.4219	15.0667	17.7115	20.3562	23.0010	25.6458
1	21.94543						
2	22.58438						
3	22.65368						
4	12.42190						
5	21.09189						
6	25.64581						
7	21.29507						
8	23.57076						
		12.42190	15.06668	17.71146	20.35623	23.00102	25.64580

TABLE 54

MARGINAL MEANS FOR THE TWO ALGEBRA CLASSES
WITHIN EACH OF THE EIGHT SCHOOLS

MARGINAL MEANS

VARIABLE 2 (CLASSES WITHIN SCHOOL)

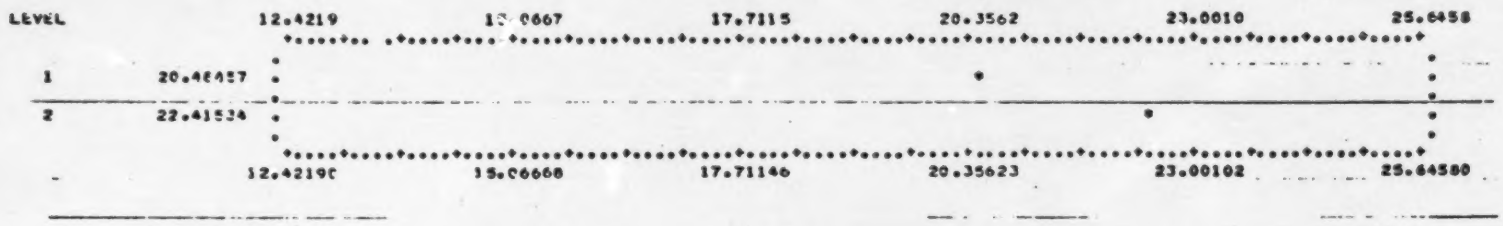


TABLE 55

MARGINAL MEANS FOR SEX OF STUDENTS WITHIN THE RESPECTIVE ALGEBRA CLASSES WITHIN EACH OF THE EIGHT SCHOOLS

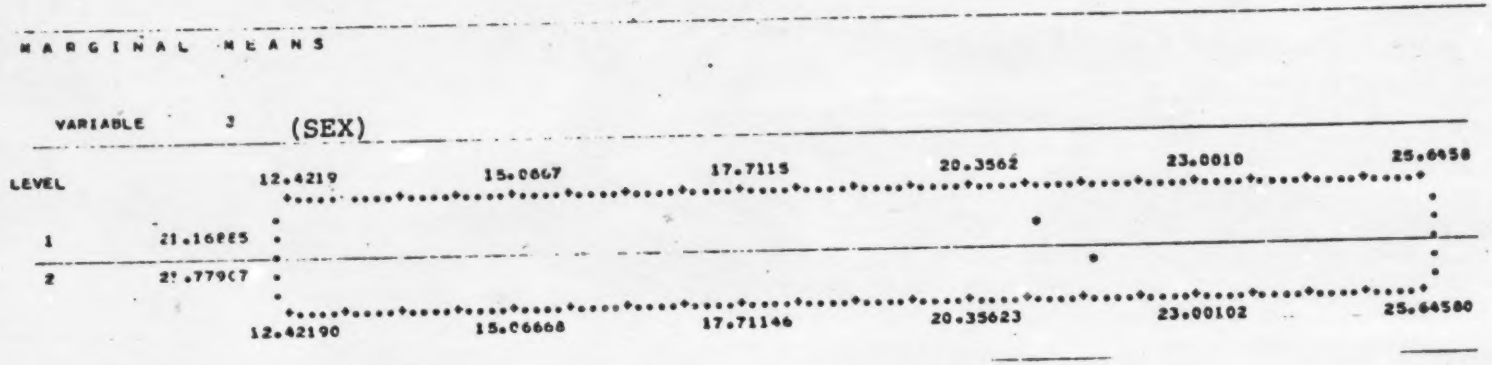


TABLE 56

A THREE-WAY TABLE OF MEANS FOR VARIABLE ONE (SCHOOL), VARIABLE TWO (CLASSES WITHIN SCHOOL), AND VARIABLE THREE (SEX) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

THREE-WAY TABLE OF MEANS FOR VARIABLES 1. 2. 3.
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 1.
16.93687 16.50533
26.61948 27.21582
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 2.
22.48438 23.23444
20.26985 24.42902
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 3.
22.97917 21.77498
22.49583 24.66063
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 4.
11.54857 11.70896
14.93332 11.45391
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 5.
24.29839 21.97050
19.78343 19.27463
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 6.
23.27837 24.29225
26.91919 27.79945
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 7.
16.69257 22.02678
22.64888 29.00186
VARIABLES 2(DOWN)X 3(ACROSS) FOR VARIABLE 1 AT LEVEL NUMBER 8.
22.54506 25.21906
21.98801 24.21593

TABLE 57

TWO-WAY TABLE OF MEANS FOR VARIABLES 2 (CLASSES WITHIN SCHOOL) DOWN x 3 SEX/ACROSS SEVEN SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 2(DOWN)X 3(ACROSS)

20.09541 20.84152
21.45721 22.[illegible]38

RESPONSE

VARIABLE 3

	20.0954	20.7776	21.4598	22.1420	22.8242	23.5064
LEVEL 1	A		B			
LEVEL 2		A				B

	20.09541	20.77760	21.45979	22.14198	22.82417	23.50636

VARIABLE 2

LEVEL 1 = A
LEVEL 2 = B
COINCIDENT POINTS = *

87

TABLE 58

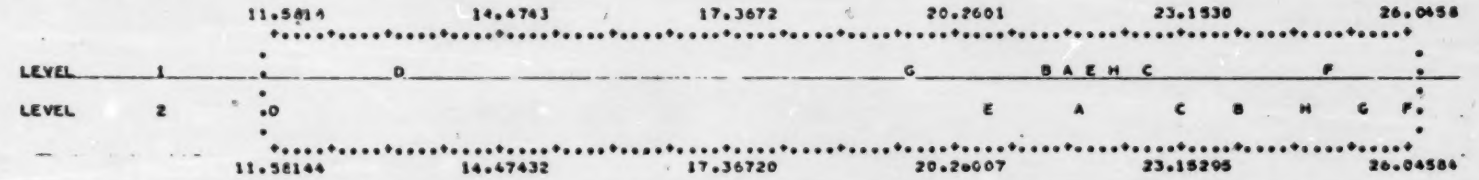
TWO-WAY TABLE OF MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 3 (SEX)/ACROSS
FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 3(ACROSS)

21.77817	21.26057
21.37711	23.83173
22.73750	23.[illegible]1780
13.24094	11.[illegible]8144
22.[illegible]4051	20.62256
25.09877	26.04585
19.67072	25.[illegible]1431
22.28653	24.71748

RESPONSE

VARIABLE 3



VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
LEVEL 8 = H
COINCIDENT POINTS = *

TABLE 59

TWO-WAY TABLE OF MEANS FOR VARIABLES 1 (SCHOOL)/DOWN x 2 (CLASSES WITHIN SCHOOL) FOR THE EIGHT SCHOOLS HAVING INTACT ALGEBRA CLASSES

TWO-WAY TABLE OF MEANS FOR VARIABLES 1(DOWN)X 2(ACROSS)

16.72410	26.91765
22.85941	22.24943
22.37708	23.57823
11.62877	12.16387
23.13445	19.52502
23.70531	27.35931
16.35966	25.82536
23.88205	22.30196

RESPONSE

VARIABLE 2

```
          11.6288          14.7749          17.9210          21.0671          24.2132          27.3593
            *....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*
LEVEL  1    .0                                A                G                C  B E  FH                .
LEVEL  2    .        D                                E                B   H C              G    A F.
            *....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*....*
          11.62877         14.77488         17.92097         21.06709         24.21320         27.35931
```

VARIABLE 1

LEVEL 1 = A
LEVEL 2 = B
LEVEL 3 = C
LEVEL 4 = D
LEVEL 5 = E
LEVEL 6 = F
LEVEL 7 = G
LEVEL 8 = H
COINCIDENT POINTS = *